Universitat de Lleida

TREBALL FINAL DE GRAU

ESCOLA POLITÈCNICA SUPERIOR
UNIVERSITAT DE LLEIDA
INSPIRING THE FUTURE

Estudiant: David Cortés Suárez

Titulació: Grau en Tècniques d'Interacció Digital i de Computació

Títol de Treball Final de Grau: ANALYSIS OF THE USABILITY OF THE BONÀREA GROUP'S INTRANET AND ITS UPDATE

Director/a: Sergio Sayago Barrantes

Presentació

Mes: Setembre

Any: 2021

When we design with usability in mind
we don't pretend to decorate, but to help
(David Cortés, July 2021)

RESUM

Durant el tercer curs del Grau en Tècniques d'Interacció Digital i de Computació he cursat Formació Dual a l'empresa Corporació Alimentària Guissona, S.A. (bonÀrea Agrupa) [1]. De manera que m'he format acadèmicament a la universitat i, a la vegada, a l'empresa on he estat treballant durant tot el curs. A l'empresa he treballat com a programador, sobretot de la intranet administrativa, i una mica enfocat al disseny.

En aquest projecte analitzaré la intranet que tenia l'empresa quan vaig començar la Formació Dual i la nova versió sobre la que hem estat treballant, comparant les dues versions mitjançant avaluacions heurístiques, sobretot, i detallaré per què la nova versió és més usable que l'anterior. Un cop acabada la comparació, proposaré millores addicionals que es podrien fer sobre la nova intranet, algunes de les quals s'han parlat ja en reunions de l'equip. En aquest anàlisi veurem que el canvi s'ha portat per un bon camí i ha aconseguit millorar realment el disseny anterior, en termes d'usabilitat.

Paraules clau

Usabilitat, Disseny, Intranet, Formació Dual, Avaluació heurística.

RESUMEN

Durante el tercer curso del Grado en Técnicas de Interacción Digital y de Computación he cursado la Formación Dual en la empresa Corporación Alimentaria Guissona, S.A. (bonÀrea Agrupa) [1]. De manera que me he formado académicamente en la universidad y, a la vez, en la empresa donde he estado trabajando durante todo el curso. En la empresa he trabajado como programador, sobre todo de la intranet administrativa, y un poco enfocado al diseño.

En este proyecto analizaré la intranet que tenía la empresa cuando comencé la Formación Dual y la nueva versión sobre la que hemos estado trabajando, comparando las dos versiones mediante evaluaciones heurísticas, sobre todo, y detallaré por qué la nueva versión es más usable que la anterior. Una vez acabada la comparación, propondré mejoras adicionales que se podrían hacer sobre la nueva intranet, algunas de las cuales se han hablado ya en reuniones del equipo. En este análisis veremos que el cambio se ha llevado por un buen camino y ha conseguido mejorar realmente el diseño anterior, en términos de usabilidad.

Palabras clave

Usabilidad, Diseño, Intranet, Formación Dual, Evaluación heurística.

ABSTRACT

During the third year of the Degree in Digital Interaction and Computing Techniques I have taken Dual Training at the company Corporación Alimentaria Guissona, S.A. (bonÀrea Agrupa) [1]. I have been academically trained at the university and, at the same time, in the company where I have been working throughout the course. In the company I have worked as a programmer, especially of the administrative intranet. I have also been dealing with user interface design issues.

In this project I will analyze the intranet that the company had when I started Dual Training and the new version on which we have been working, comparing the two versions through heuristic evaluations, and I will detail why the new version is easier to use than the previous one. Afterwards, I will propose additional improvements that could be made to the new intranet, some of which have already been discussed in team meetings. In this analysis we will see that the change has been on the right track and it really improved the previous design in terms of usability.

Keywords

Usability, Design, Intranet, Dual Training, Heuristic Evaluation.

LIST OF FIGURES

Figure 1 – Current intranet login 19
Figure 2 – Current intranet login 19
Figure 3 – Company selector of the current intranet 20
Figure 4 – Lateral selector of the current intranet 20
Figure 5 – Current intranet module selector 21
Figure 6 – “empresa” module “seccions” sub module of the current intranetl 21
Figure 7 – Current intranet submodules drop-down selector 22
Figure 8 – "empresa" module "seccions" sub-module of the current intranet 25
Figure 9 – Enlarged view of the "empresa" module and the "seccions" sub-module 25
Figure 10 – Loading icon 26
Figure 11 – "Adminsitració" module "Plantilles" sub-module of the current intranet 26
Figure 12 – "Administració" module "Plantilles" sub-module with open filters 26
Figure 13 – Module selector and sub-module selector 27
Figure 14 – Title of the sub-module "Consult Phones" with download icon 27
Figure 15 – Filter menu 27
Figure 16 – Pop-up error 403 28
Figure 17 – Error without specification 28
Figure 18 – Large search warning 29
Figure 19 – Intranet new login page 29
Figure 20 – Home page of the new intranet 30
Figure 21 – Company selector of the new intranet 30
Figure 22 – Module selector of the new intranet 30
Figure 23 – Magnified view of a module selector element 31
Figure 24 – "Empresa" module "seccions" sub-module of the new intranet 31
Figure 25 – Extended view of the selectors 35
Figure 26 – Enlarged view of the current intranet 37
Figure 27 - Enlarged view of the current intranet 37
Figure 28 – Module "empresa” "seccions" sub module of the current intranet 38
Figure 29 - "Empresa" module "seccions" sub module of the new intranet 38
Figure 30 - Company selector of the current intranet 39
Figure 31 - Home page of the new intranet 40
Figure 32 - “Tens problemes per accedir?” button 41
Figure 33 – Example of Horror Vacui 41
Figure 34 - Example of the absence of Horror Vacui 42
Figure 35 - Example of similarity 43
Figure 36 - Example of “Most Advanced Yet Acceptable” 45
Figure 37 - View of Azure filters 46
Figure 38 - Azure filter editing view 46
Figure 39 – Color palette 47
Figure 40 – Fonts used 47
Figure 41 – Inputs design 48
Figure 42 - Example of "Form Follows Function" 49
Figure 44 – Home of the new intranet 53
Figure 45 – Proposed new intranet home page 54
Figure 46 – Current download icon 55
Figure 47 – Proposed download icon 55

Figure 48 – Proposal of error messages 56
Figure 49 – Pop-up error 403 57
Figure 50 – Error message without specification 57
Figure 51 – Proposed search tool 58
Figure 52 – Icon to access the documentation 59
Figure 53 – Documentation section 59
Figure 54 – Loading screen 60
Figure 55 – Proposed loading page 60

INDEX

1. INTRODUCTION 9
1.1 MOTIVATION 9
1.2 OBJECTIVES AND TIME PLANNING 10
1.3 CONTEXT 11
1.3.1 THE COMPANY 11
1.3.2 HEURISTIC EVALUATION 11
1.3.3 TypeScript 12
1.3.4 Lunacy 12
1.4 SUMMARY OF WORK DONE 13
1.5 ORGANIZATION 14
1.6 HEURISTIC EVALUATION SYSTEM OF THE TWO VERSIONS 15
2. CURRENT VERSION OF THE INTRANET 19
2.1 HEURISTIC EVALUATION OF THE CURRENT INTRANET 23
2.2 DISCUSSION OF RESULTS 25
3. NEW VERSION OF THE INTRANET 29
3.1 HEURISTIC EVALUATION OF THE NEW INTRANET 33
3.2 DISCUSSION OF THE RESULTS 35
4. ANALYSIS OF THE RESULTS OF HEURISTIC EVALUATIONS 37
4.1 DESIGN PRINCIPLES USED 41
5. ASPECTS TO IMPROVE 51
6. PROTOTYPE 53
7. INTERVIEWS WITH EMPLOYEES 62
7.1 RESULTS OF THE INTERVIEWS 63
8. REFLECTION 65
9. CONCLUSIONS 67
10. REFERENCES 69
ANNEX I 70

1. INTRODUCTION

The intranet is the heart of a company, it is the place where all the data is entered and consulted by the workers. Employees spend several hours in this system and it is very important that they feel comfortable and it does not suppose an extra effort to understand the functioning and how to run it.

For this reason, the IT department and Systems of the General Management of the Corporació Alimentària Guissona, we have started working on the renewal of the intranet, not only in terms of design, which is what I will analyze in this TFG, but also the internal operation, as we have changed the language in which it is programmed, from Polymer (JavaScript) to TypeScript.

In this TFG, I will analyze the improvement of usability thanks to the modification and propose new changes that would improve it even more.

1.1 MOTIVATION

When I had to decide the topic of the TFG I previously knew that it would be related to the company where I have completed the Dual Training, by that time I had three main motivations:

- To analyze the work we are doing to verify that we are really improving the system.
- To propose further improvements on the final result of the work through a prototype.
- To use, for the other purposes, the knowledge and tools we have worked on at the university, such as heuristic evaluations and prototyping tools.

This project fulfills all the points, so I consider that I have the required motivation to carry it out.

1.2 OBJECTIVES AND TIME PLANNING

The main objective of this work is to analyze, following previously selected guidelines, the change of the design of the intranet of the company where the Dual Training course takes place with the one planned to evaluate the real improvement and determine if it has really been a change that has improved the usability of the system.

This objective, which covers many things, could be divided it as follows:

- Analyze the usability of the company's current intranet
    - Heuristic evaluation
- Analyze the usability of the company's new intranet
    - Heuristic evaluation
- Compare the results
- Find potential improvements to the system
    - Carry out a prototype with the improvements
    - Analyze the prototype to verify the improvement

The time planning has been set out by months, allocating one month, or more, to a part of the project, a summary of the planning is as follows:

- February: Preparation of the initial report
- March - April: Analysis of the current intranet
- May: Analysis of the new intranet
- June: Comparison of results and prototype initiation
- July: Completion of prototype and analysis of it
- August: Final formal drafting of report and preparation of the presentation
- September: Presentation

For a more detailed time schedule, consult the 1.5 ORGANIZATION section.

1.3 CONTEXT

In this section I will explain in more detail the technologies and methods that I will use and comment on later, so that there is already prior knowledge and we know what we are talking about.

1.3.1 THE COMPANY

bonÀrea Agrupa [1] has extensive experience in the agri-food sector. It develops all the livestock, industrial and commercial activities required to reach the consumer; it carries out a complete vertical integration without intermediaries. Since 1959 they have been incorporating into the productive, business and commercial structure the necessary elements to become who they are.

When it was born, it did so as a cooperative called Cooperativa Avícola de Guissona, over the years it has ceased to be and currently the group has 9 companies: bonÀrea Alimenta, bonÀrea Mascota, bonÀrea Fundación Asistencia, bonÀrea Fundación Sport, bonÀrea Energía, bonÀrea Telecom, bonÀrea Asegura, bonÀrea Asesora and CaixaGuissona.

1.3.2 HEURISTIC EVALUATION

Non-user usability inspection method. It consists of examining the quality of usability of an interface by expert evaluators, based on the fulfillment of recognized usability principles, usually the Nielsen 10 principles.

This is the main advantage of this practice, it is not necessary the participation of the end users to evaluate if the system is usable or not.

In this research, however, I have not only used Nielsen's principles. As we will see later, I have used an improvement suggested by the professor of the University of Lleida, Toni Granollers [2]. This proposal increases this number of principles to 15, combining them with those suggested by Tognazzini. In this way, we obtain a result with more valued aspects and with a specific score, since Toni's system provides a numerical evaluation system.

1.3.3 TypeScript

It is a programming language developed and maintained by Microsoft, it is a superset of JavaScript [11], which means that it adds features that make it a language with much more potential. The main improvements it provides are the following:

- Verification of the type of dada (typed).
- Support of different versions of EcmaScript.
- Simple object-oriented programming.
- Compiled language, which avoids problems during execution.
- Facilitates readability in large projects.

In addition to those already provided by JavaScript:

- Speed
- Simplicity
- Simple interfaces
- Versatility

1.3.4 Lunacy

It is a vector graphics editor developed by Iconos8, a team specialized in developing free tools and resources for designers and creatives [13]. It allows to organize elements by layers, to organize pages and work tables, to draw, to join, to align objects...

Lunacy is known as the equivalent of Sketch (for MacOS) compatible for Windows and free. As it could not be otherwise, it has full compatibility with Sketch, and even allows to save projects in the format of the other.

It also allows to work without internet connection, and to introduce CSS code, which is very interesting in our case, since what we will design is a web page.

Some of the features that differentiate it from the competition are:

- Simplified interface
- Offline operation
- Compatibility with Sketch

- Free of charge

Its direct rivals are Adobe XD and Sketch, the latter is exclusive to MacOS and both require the purchase of a license.

1.4 SUMMARY OF WORK DONE

In this paper, the work done is divided into three main blocks, also appreciable in the 1.5 ORGANIZATION of time.

Firstly, there is the block dedicated to the current intranet, where I will define and analyze the design of the intranet active at the moment, which is the same as when I started working on it, because the new one is still under development.

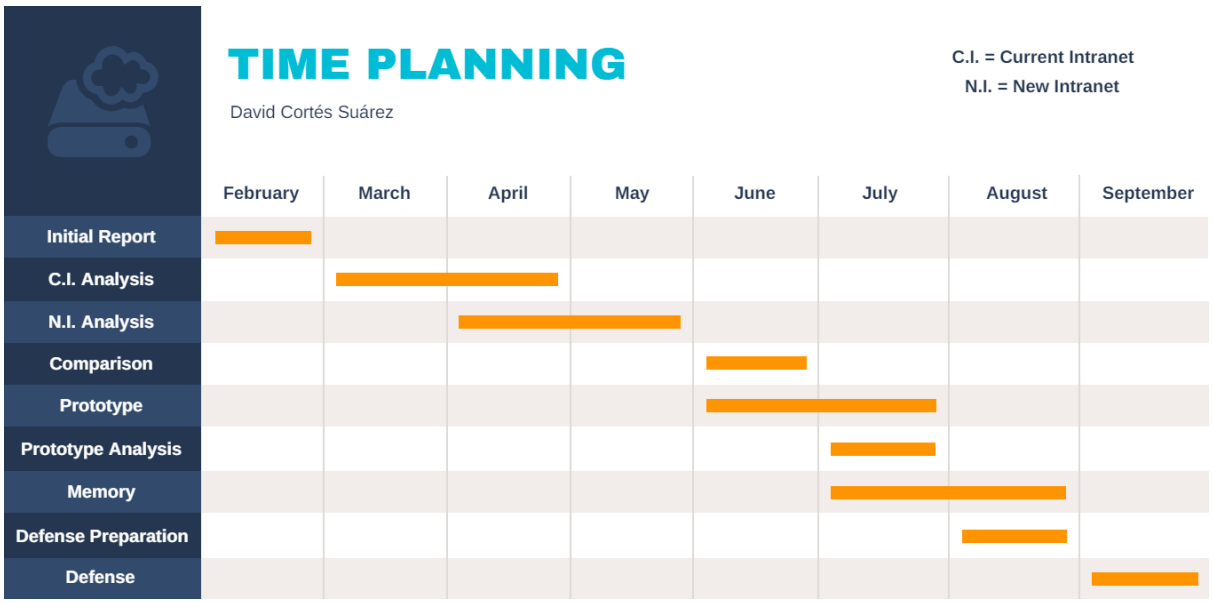
Next, the blog of the new intranet, where I will define and analyze the design of the intranet that we have been developing during these months and that is still being built.

Then, the comparison of results and proposal of improvement, where I will detail the results obtained from the evaluations of the two versions and will propose a series of improvements through prototypes that will enhance, even more, the usability of the new system.

Finally, I will make a discussion where I will evaluate all the worked aspects and if they have been adequate, that is to say, if I have analyzed what I had to analyze, if I have used the appropriate technologies and methodologies, if I have obtained the results I expected, if I am proud of the topic I have chosen, etc.

1.5 ORGANIZATION

The organization of the time for the elaboration of the work was decided at the moment of submitting the initial report, agreeing with the mentor the work to be done each month.



The tasks that could be more difficult were established with an approximate duration of between one and a half and two months, such as the analysis of the current intranet, the analysis of the new intranet, the prototype and the drafting of the memo. Other tasks such as the comparison of the results, the analysis of the prototype and the preparation of the defense did not take more than a month of work.

This organization has been followed during almost all the time, but the month of July has been a bit overloaded, since at first I thought to finish the Dual Training in June but finally I was asked to extend the contract so I didn't have as much time as I thought at the beginning. In any case, however, I have been able to work on the job at a rate very similar to what I had expected. If I had to adapt it to reality I would only have to extend a bit the line of analysis of the prototype by taking some weeks in August.

Since February, my mentor Sergio and I have been meeting virtually every two weeks, so that we could follow up quite closely the work I was doing and if the approach of the work was the right one.

1.6 HEURISTIC EVALUATION SYSTEM OF THE TWO VERSIONS

In 2018, Toni Granollers, professor at the University of Lleida, carried out a research called "Usability Evaluation with Heuristics, Beyond Nielsen's List" [2]. In this study he presents a substantial improvement of Nielsen's design principles by enumerating a new list of generalized design principles for any interface, a set of questions to analyze the existence of these principles, a classification system to answer the questions and a method to obtain a numerical valuation that he calls Usability Percentage (usability percentage).

Toni Granollers states that when someone uses Nielsen's list of design principles, it is often due to a lack of knowledge about them and, possibly, about the technique itself.

In the same study, the author selects Nielsen's and Tognazzini's design principles, since they are the best known and of the highest quality, and combines them (going through a review phase, a comparison phase and an integration phase), in such a way that each principle is more specific and a longer list is left that includes more points.

As a result, the remaining list is:

1. Visibility and system state: It refers to how well the system state is transmitted to the users.
2. Connection between the system and the real world, metaphor usage and human objects: The systems have to speak the user's language, in other words, use familiar words, phrases and concepts instead of system-oriented terms.
3. User control and freedom: Users often make mistakes or change their minds, and they must have the option of being able to abandon the work flow or defer the last action.
4. Consistency and standards: Never confuse users by using different words to refer to the same thing, or apply different designs, actions or situations.
5. Recognition rather than memory, learning and anticipation: Try to minimize the users' memory drain by making visible the objects, actions and options at hand. The user does not have to remember instructions or information.
6. Flexibility and efficiency of use: Consists of providing users with ways to speed up their work.
7. Help users recognize, diagnose and recover from errors: Error messages must be expressed in simple language, indicate it precisely and suggest a constructive solution.
8. Preventing errors: Promote code quality to reduce the occurrence of errors by anticipating typical user errors.

9. Aesthetic and minimalist design: Aesthetically pleasing designs can provide pleasant experiences that make the difference on a brand, bearing in mind that the clarity of the system is above the visual bloom.
10. Help and documentation: The system must be so easy to use that users do not need documentation or help, but it is practically impossible to prevent what all users will do and we must consider the reality that they will not know how to do some tasks or make errors, so it is important to have a good documentation that helps to understand the functioning.
11. Save the state and protect the work: We often lose the work done in an application or system because it has been unintentionally or accidentally deleted or closed, it is very important that the system guarantees the recoverability of this work and the state of the system as we left it.
12. Colour and readability: A web page can be affected by the combination of colors to differentiate the first page from the bottom. This part has to be combined with the design.
13. Autonomy: Users must have control of the system, both of the interface and the environment. They must be kept informed but with full autonomy.
14. Defaults: The default values must have a value that makes sense. In addition, they must be easy to eliminate or replace.
15. Latency reduction: The worst thing for the users is to have to wait for a response from the system without being able to do anything in the meantime, therefore, the loading time has to be reduced as much as possible.

These principles are the ones that will be analyzed if we follow the proposed methodology.

According to the guide, the following questions should be asked:

1. Visibility and system State
    a. Does the application include a visible title page, section or location?
    b. Does the user always know where he/she is?
    c. Does the user always know what the system or application is doing?
    d. Are the links correctly defined?
    e. Can all actions be viewed directly? (No other actions are required)
2. Connection between the system and the real world, metaphor usage and human objects
    a. Does the information appear in a logical order for the user?
    b. Does the design of the icons correspond to everyday objects?
    c. Does each icon perform the expected action?
    d. Does the system use phrases and concepts familiar to the user?
3. User control and freedom
    a. Is there a link to return to the initial status or home page?
    b. Are the functions "desfer" and "refer" implemented?
    c. Is it easy to return to a previous status of the application?
4. Consistency and standards
    a. Do the link labels have the same names as their destinations?

   b. Do the same actions always have the same results?
   c. Icons have the same meaning everywhere?
   d. Is the information displayed consistently on each page?
   e. Are the colors of the links standard? If not, are they appropriate for your use?
   f. Do the navigation elements follow the standards?
5. Recognition rather than memory, learning and anticipation
   a. Is it easy to use the system for the first time?
   b. Is it easy to locate information that you have searched for before?
   c. Can you use the system at any time without remembering previous screens?
   d. Is all the necessary content for navigation or the task found on the "current screen"?
   e. Is the information organized according to a logic familiar to the end user?
6. Flexibility and efficiency of use
   a. Are there any keystroke preferences for common actions?
   b. If so, is it clear how to use them?
   c. Is it possible to easily repeat a previously performed action?
   d. Does the design adapt to screen resolution changes?
   e. Is the use of accelerators visible to the normal user?
   f. Does it always keep the user busy? (no unnecessary delays)
7. Help users recognize, diagnose and recover from errors
   a. Does it display a message before performing irreversible actions?
   b. Are errors displayed in real time?
   c. Is the error message displayed easily interpretable?
   d. Is any code used to refer to the error?
8. Preventing errors
   a. Is a confirmation message displayed before performing the action?
   b. Is it clear what has to be entered in each box of a form?
   c. Does the search engine tolerate typos and spelling errors?
9. Aesthetic and minimalist design
   a. Is a design without redundancy of information used?
   b. Is the information brief, concise and precise?
   c. Each element of information is different from the rest and is not confusing?
   d. Is the text well organized, with short sentences and quick to interpret?
10. Help and documentation
   a. Is there a "help" option?
   b. If so, is it visible and easily accessible?
   c. Is the help section aimed at answering questions?
   d. Is there a FAQ section?
   e. Is the help documentation clear, with examples?
11. Save the state and protect the work
   a. Can users continue from a previous state (where they were before or from another device)?
   b. Is the "autosave" implemented?
   c. Does the system have a good response to external failures?

12. Colour and readability
    a. Does the font have an adequate size?
    b. The font uses colors with sufficient contrast with the background?
    c. Do the background images or patterns allow the reading of the content?
    d. Does it consider people with reduced visibility?
13. Autonomy
    a. Do you keep the user informed of the status of the system?
    b. Furthermore, is the system status visible and updated?
    c. Is the user able to make his own decisions? (Personalization)
14. Defaults
    a. The system offers the option to return to the factory configuration?
    b. If so, does it clearly indicate the consequences of the action?
    c. Is the term "default" used?
15. Latency reduction
    a. Is the execution of heavy workloads transparent to the user?
    b. While heavy tasks are being performed, is the remaining time or any animation shown to the user?

Once all these questions have been answered, the scoring system works as follows:

- Yes: 1 point
- No: 0 points
- Neither yes or no: 0,5 points
- Not applicable: -

At first the grade is calculated on 60, since this is the number of questions. But every time a "Not applicable" answer appears, this question will be subtracted from the total. So we will only take into account the questions with answers "Yes", "No" and "Neither yes nor no".

2. CURRENT VERSION OF THE INTRANET

The currently published version of the intranet, as we will see later, has many design errors, some of them easily rectifiable, and others that involve a redesign or a major change.

The first thing we see when we enter is the login page.

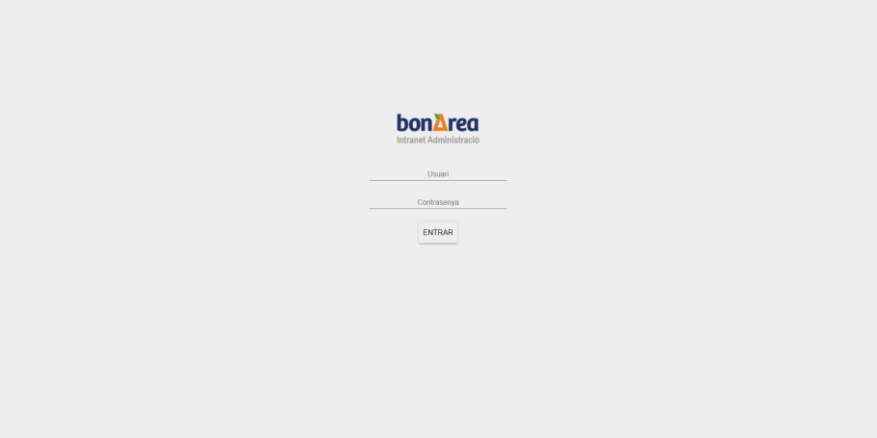


Figure 1 – Current intranet login

Figure 2 – Current intranet login

As we can see the spaces to introduce the user name and the password are very basic, the button has a very low contrast and there is no help button in case of having forgotten the password or any other doubt that may arise for the employees who have to use it.

Once we have logged in, we have to select the company on which we want to carry out the queries, the menu has the following appearance:

Figure 3 – Company selector of the current intranet

The letters are not completely visible, it is a conscious design decision but it is not correct as many letters could be confusing and 4 of the companies do not allow the complete reading of the name. In addition, the white light effect that each company has diminishes the contrast to the point of making it difficult to read in normal conditions, as is the case of the company "Fundación bonÀrea", where the name is not readable and the second word is almost invisible.

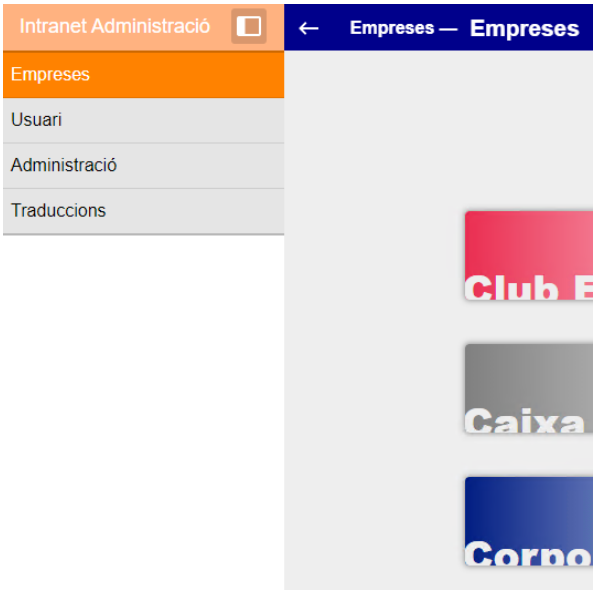


Figure 4 – Lateral selector of the current intranet

In case of wanting to enter the menus "user", "administration" and "translations" it is not necessary to select the company, and it may not be clear because the user first looks at the title that says "Select the company".

Once we have selected the company we have to select the module.

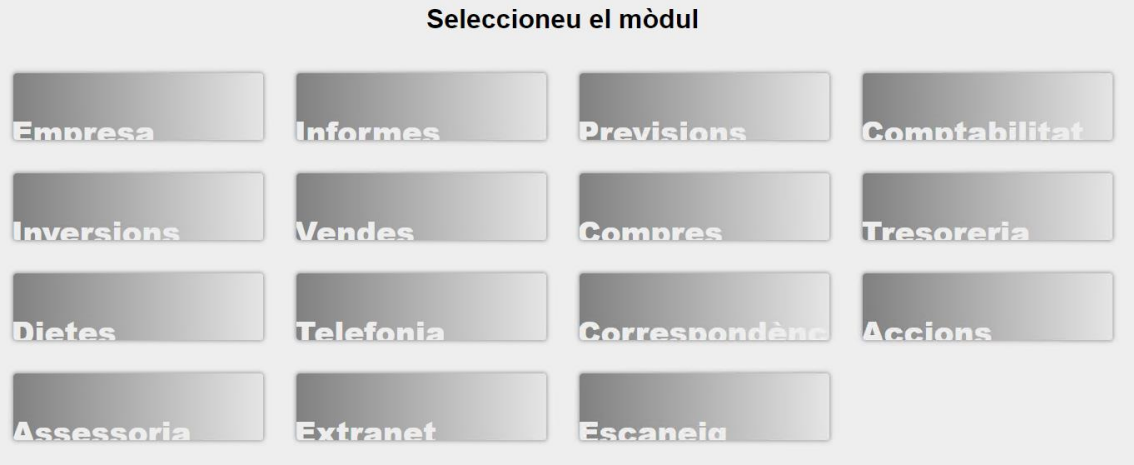


Figure 5 – Current intranet module selector

The conclusions of this design are the same as in the company selector with the difference that this menu does not differentiate the modules with colors or icons. We can also select the module from the side menu.

If we enter the "empresa" module, we will see this screen:

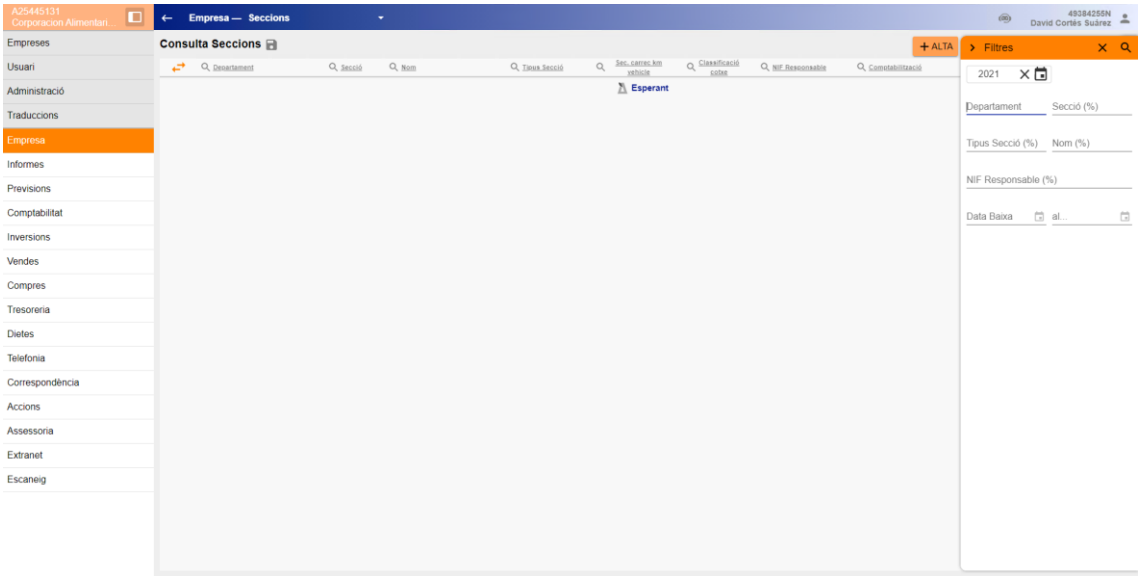


Figure 6 – "empresa" module "seccions" sub module of the current intranetl

At this point we already have access to the data on the sections of the company, on the right side we have the filters by the locks and the buttons to search and browse the filters, this component is displayed to leave in full view the table where the results will be displayed.

Using the selector at the top of the screen we can navigate between the sub-modules.

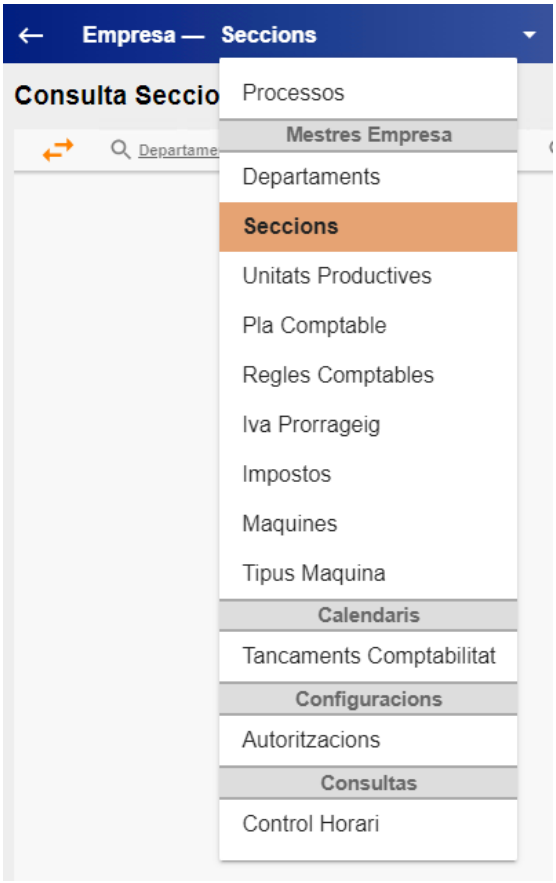


Figure 7 – Current intranet submodules drop-down selector

This selector sorts the sub-modules by categories. The design problem is the location and I will comment it later, after the heuristic evaluation.

In summary, this is the intranet system that is currently in the company. It is developed with Polymer, an open source JavaScript library developed by Google, its main features are the simplification of the creation of custom elements, conditional and repetitive templates and gestural events.

2.1 HEURISTIC EVALUATION OF THE CURRENT INTRANET

First I will answer the questions mentioned above and then I will comment on some of the principles that I consider important to highlight.

1. Does the application include a title page, section or visible location?: **Neither yes nor no (0.5)**
2. Does the user always know where he/she is?: **Yes (1)**
3. Does the user always know what the system or the application is doing?: **Yes (1)**
4. Are the links correctly defined?: **Yes (1)**
5. Can you visualize all the actions directly? (No other actions are required): **No (0)**
6. Does the information appear in a logical order for the user?: **No (0)**
7. Does the design of the icons correspond to everyday objects?: **Yes (1)**
8. Does each icon perform the expected action?: **Neither yes nor no (0,5)**
9. Does the system uses phrases and concepts familiar to the user?: **Yes (1)**
10. Is there a link to return to the initial status or home page?: **Neither yes nor no (0,5)**
11. Have the functions "desfer" and "refer" been implemented?: **No (0)**
12. Is it easy to return to a previous status of the application?: **Yes (1)**
13. Do the link labels have the same names as their destinations?: **Yes (1)**
14. The same actions always have the same results?: **Yes (1)**
15. Do the icons have the same meaning everywhere?: **No (0)**
16. Is the information displayed consistently on each page?: **Yes (1)**
17. Are the colors of the links standard? If not, are they suitable for your use?: **Yes (1)**
18. Do the navigation elements follow the standards?: **Yes (1)**
19. Is it easy to use the system for the first time?: **No (0)**
20. Is it easy to locate information that you have searched for before?: **Yes (1)**
21. Is it possible to use the system at any time without remembering previous screens?: **Yes (1)**
22. All the necessary content for navigation or task is on the "current screen"?: **Yes (1)**
23. Is the information organized according to a logic familiar to the end user?: **No (0)**
24. Are there any keyboard shortcuts for common actions?: **No (0)**
25. If so, is it clear how to use them?: **Not applicable (-)**
26. Is it possible to easily perform a previously performed action?: **Yes (1)**
27. Does the design adapt to the screen resolution changes?: **Yes (1)**
28. Is the use of accelerators visible to the normal user?: **Not applicable (-)**
29. Does it always keep the user busy? (without unnecessary delays): **Not applicable (-)**
30. Is a message displayed before performing irreversible actions?: **Yes (1)**
31. Are errors shown in real time: **Neither yes nor no (0,5)**
32. Is the error message that appears easily interpretable?: **Neither yes nor no (0,5)**
33. Is any code used to refer to the error?: **Neither yes nor no (0,5)**
34. Does a confirmation message appear before performing the action?: **Yes (1)**
35. Is it clear what has to be entered in each box of a form?: **Yes (1)**

36. Does the search engine tolerate typing and spelling errors?: **No (0)**
37. Is a design without redundancy of information used?: **Yes (1)**
38. Is the information brief, concise and precise?: **Yes (1)**
39. Each element of information is different from the rest and is not confusing?: **Yes (1)**
40. Is the text well organized, with short sentences and quick interpretation?: **Yes (1)**
41. Is there a "help" option: **No (0)**
42. If so, is it visible and easy to access?: **Not applicable (-)**
43. Is the help section aimed at answering questions?: **Not applicable (-)**
44. Is there a FAQ section?: **No (0)**
45. Is the help documentation clear, with examples?: **Yes (1)**
46. Can users continue from a previous status (where they were before or from another device)?: **Neither yes nor no (0,5)**
47. Is the "autosave" implemented?: **No (0)**
48. Does the system have a good response to external failures?: **No (0)**
49. Does the font have an adequate size?: **Yes (1)**
50. The font uses colors with enough contrast with the background?: **Yes (1)**
51. Do the background images or patterns allow the reading of the content?: **Yes (1)**
52. Do you consider people with reduced visibility: **Not applicable (-)**
53. Do you keep the user informed about the status of the system?: **Neither yes nor no (0,5)**
54. In addition, is the status of the system visible and updated?: **Neither yes nor no (0,5)**
55. Can the user make his own decisions? (Personalization): **Yes (1)**
56. The system offers the option to return to the factory settings?: **Yes (1)**
57. If so, does it clearly indicate the consequences of the action?: **No (0)**
58. Is the term "default" used?: **No (0)**
59. Is the execution of heavy work transparent to the user?: **No (0)**
60. While heavy tasks are being performed, is any animation shown to the user during the remaining time?: **No (0)**

Total of questions without the not applicable ones: **54**

Total number of questions answered with "Yes": **29**

Total number of questions answered with "No": **17**

Total number of questions answered with "Neither yes nor no": **8**

Total points: **33/54**

As we can see, the page has obtained a score equivalent to 61.11%. Next, I would like to highlight and explain some of the answers using screenshots in order to have a visual reference of what we are talking about and why this is the score.

2.2 DISCUSSION OF RESULTS

To questions 1 and 2 the answer is yes, the user knows where he is at all times because as we can see in the following image both the side menu and the top menu indicate which module and sub-module we are in but, however, we do not have a main title of the intranet, we only see the company about which we are consulting the information and what I have commented above.

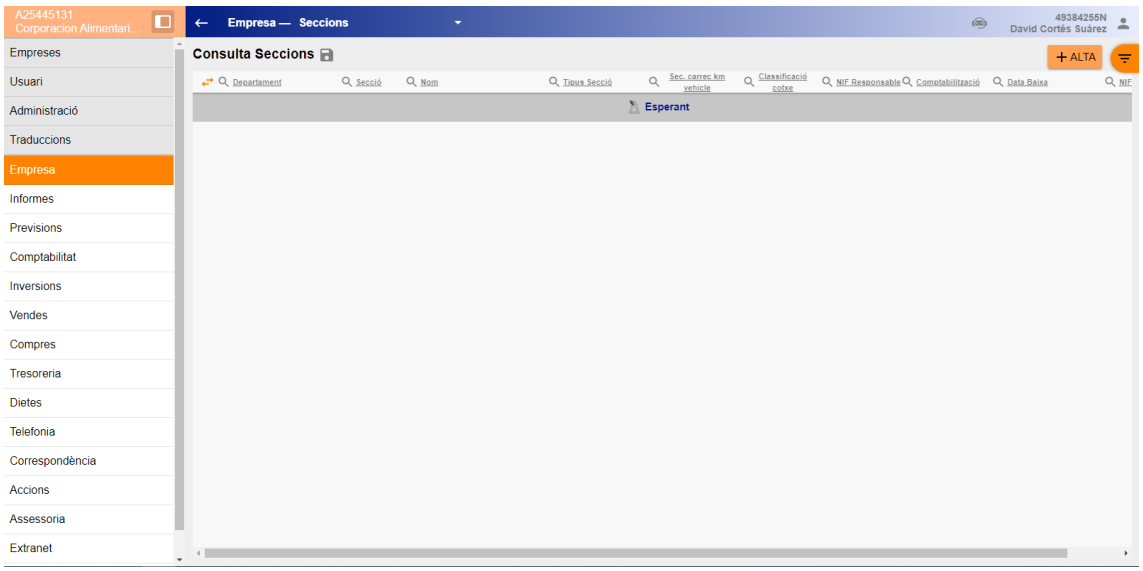


Figure 8 – "empresa" module "seccions" sub-module of the current intranet

Figure 9 – Enlarged view of the "empresa" module and the "seccions" sub-module

The user knows what the system is doing (question 3), before making a query the status "waiting" appears, as we can see in the previous screenshot and while performing the download we can read "loading".

Figure 10 – Loading icon

We cannot see all the actions that we can perform directly (question 5), since for opening the data filtering and queries menu we have to select a menu that appears on the right side of the screen.

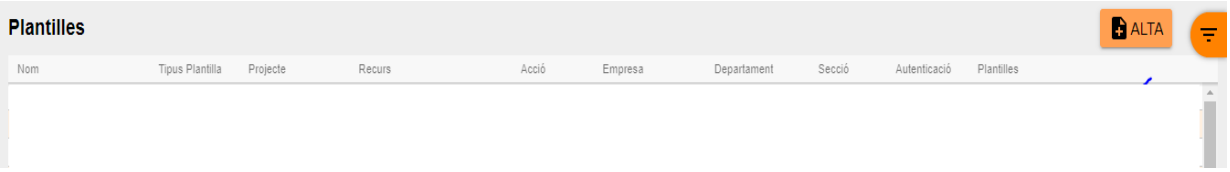


Figure 11 – "Adminsitració" module "Plantilles" sub-module of the current intranet

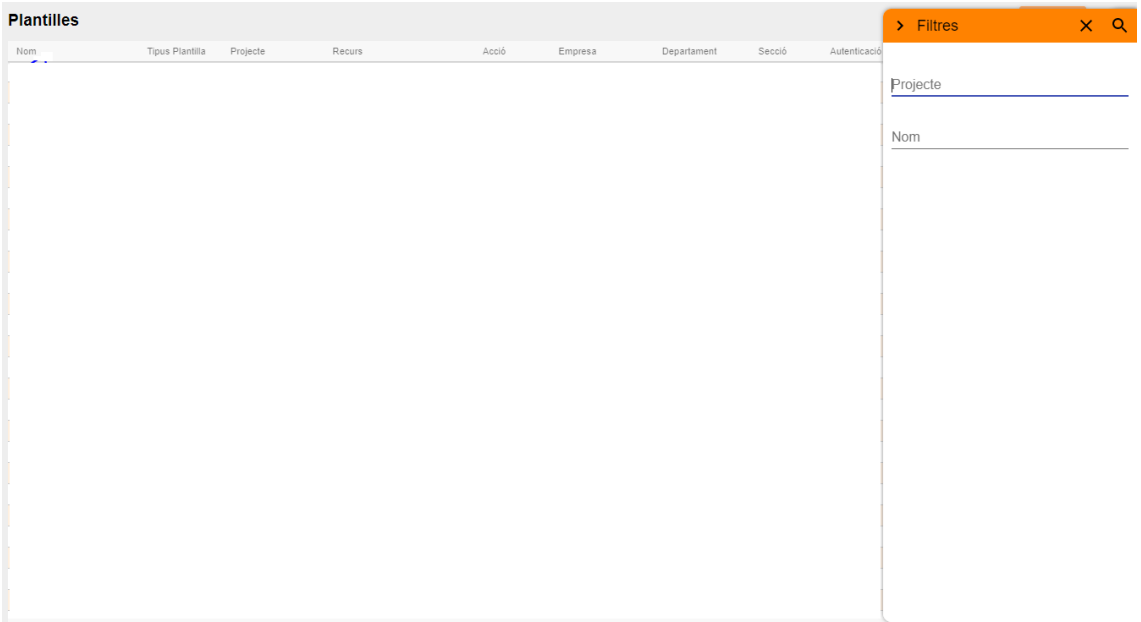


Figure 12 – "Administració" module "Plantilles" sub-module with open filters

The order of the information is not very intuitive or familiar to users (questions 6 and 23), since first we have to select a module from the vertical side menu, and once we have selected it, we can select the sub-module through the drop-down menu at the top of the page, above the side menu although it depends on it.

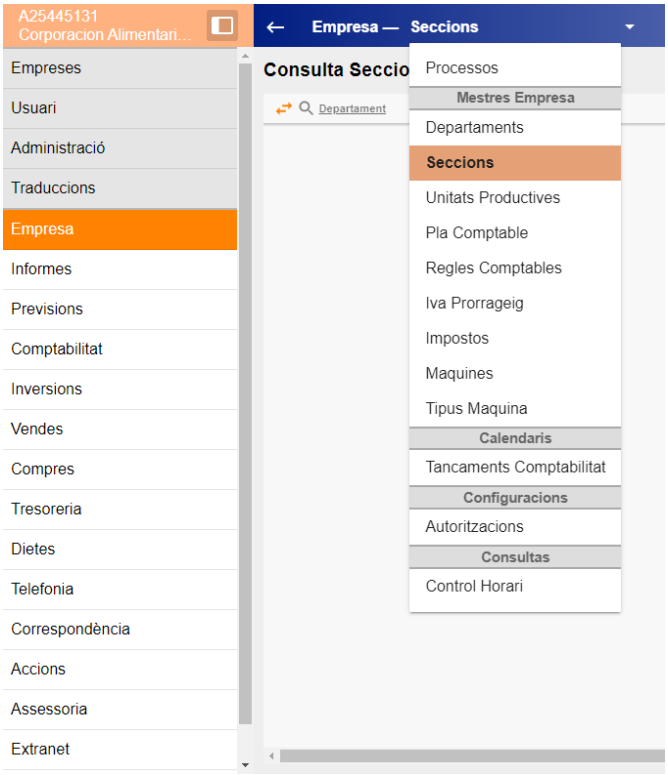


Figure 13 – Module selector and sub-module selector

The same icons do not mean the same thing everywhere and some may perform an action that we do not expect (questions 8 and 15). For example we have the download button, in some screens it appears next to the title and in others in the filter menu. Although the user may not realize it, the action they perform is not the same, when we press the download button that appears in the title, we download the data that appears on the table (the results of the query we have performed). On the other hand, when it appears in the filter menu, the system performs a new query and returns the results in the form of a file (excel or pdf, as in the other case).

Figure 14 – Title of the sub-module "Consult Phones" with download icon

Figure 15 – Filter menu

This difference, although it may not be perceived by the user, does not cease to exist and can lead to an action that we do not expect, because if we perform a query to display it on the screen, without downloading data, then we change the filters, but without closing and

then we press the download button of the filters menu, the data that we will visualize on the intranet will be different to the downloaded ones, without having pressed the close button.

Returning to a previous status is very easy (question 12), thanks to a link system implemented, if we want a company to perform a query that we have already done, we just have to pass the link and the filters will be filled automatically.

The errors (questions 31, 32 and 33) are often displayed as a pop-up with a reference code and a brief description.

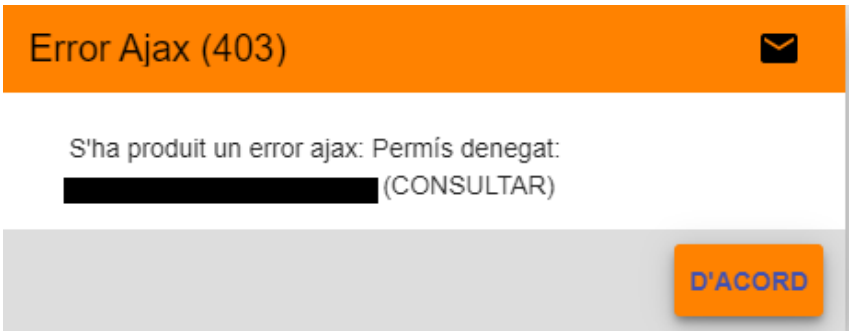


Figure 16 – Pop-up error 403

In other cases, however, this pop-up window does not appear and you can only see how the system status may give "error".

Figure 17 – Error without specification

Regarding colors and legibility, the letters in almost all cases have a high contrast, and a good size and location facilitating reading. The design is not minimalist but it is appropriate to the context, since it is a system to access data from the company's databases and the abundance of information is normal and necessary.

Another point that I would like to highlight is that in cases where the user wants to perform a more complex query and that, therefore, the system will take a little longer to load them, a warning appears with the approximate time of the query and the option to cancel it.

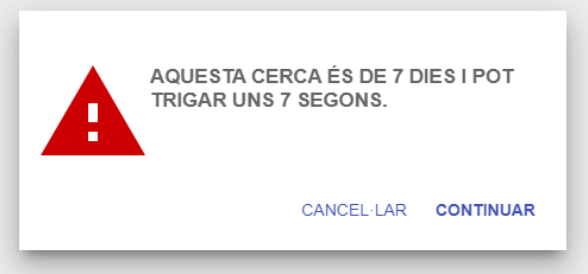


Figure 18 – Large search warning

If this warning does not appear, the user may think that the system or the database is not working and leave the space before the data arrives.

3. NEW VERSION OF THE INTRANET

The new version of the intranet that will be analyzed next incorporates great design improvements, it has gone through many decision making processes through meetings and voting, of which I am proud to say that I have been part of.

The login page, compared to the previous one, is much more attractive, gives instructions to the user, offers to change the user's language and a help button appears in case of not being able to log in.

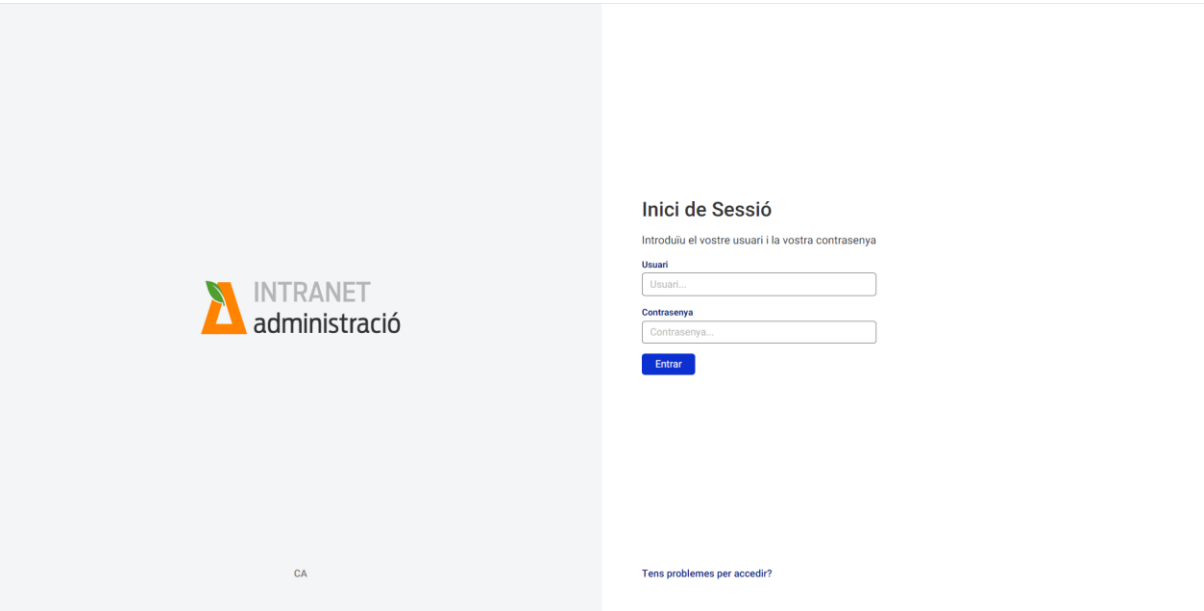


Figure 19 – Intranet new login page

The whole design has become much more colorful and attractive, the icons far more representative as well as realistic, since the previous ones were all black or nonexistent, as the modules did not have icons.

The company selector, moreover, has become a drop-down always located at the top and has improved all the previous design problems except that it does not fit the names in full, although it is difficult to correct because reducing the size of the letter would make it too small and adding another line would make the selector too big, and it is not worth it because there can be no confusion.

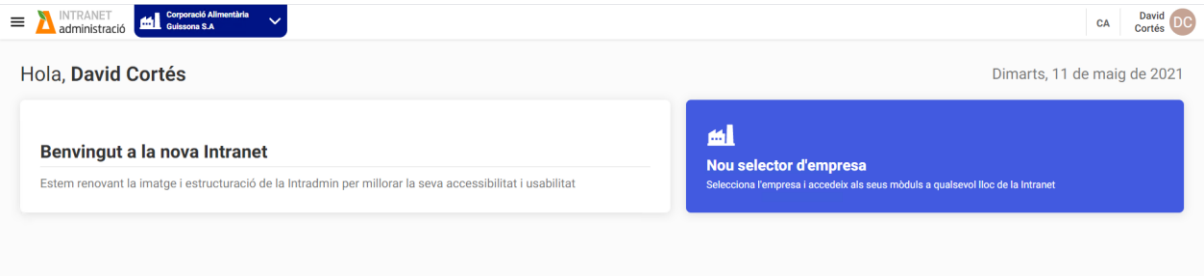


Figure 20 – Home page of the new intranet

Figure 21 – Company selector of the new intranet

Once we select the company we access the module selector, very different from the previous one, with icons and a more minimalist design.

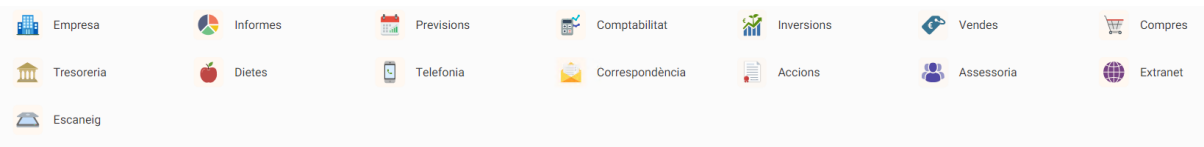


Figure 22 – Module selector of the new intranet

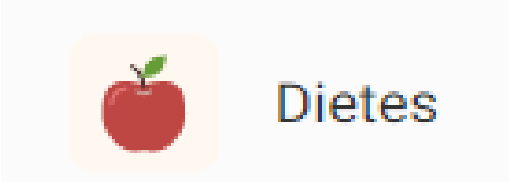


Figure 23 – Magnified view of a module selector element

One of the main usability issues that was how the information was organized (with the even menu at the side and the full menu at the top) has been solved, now the drop-down menu at the top of the page, clearly separated from the content, is the selector of the company on which we want to make the query, and once we select one of the modules, a screen like the following one appears:

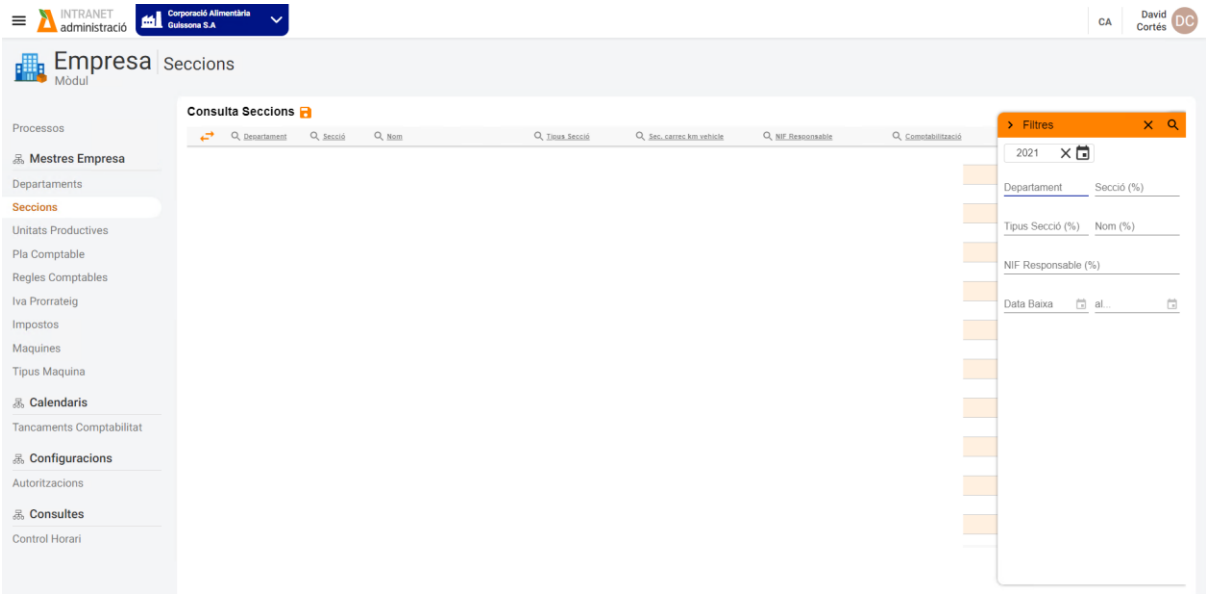


Figure 24 – "Empresa" module "seccions" sub-module of the new intranet

The setting is very welcoming and does not burden the view as the previous one. The menu to select the company is visible as well as the name of the module and the sub-module in which we are. The sub-module selector is on the left side but always visible, since, when we work with one of the modules (for example "Empresa"), what we are interested in is to navigate between the sub-modules in a fast and efficient way.

The module selector is invisible, previously it was located on the left side but as this position has been occupied we have chosen to place it on the upper left side, specifically it will appear when we click on the module name. This selector is not yet implemented so I can't add an image that represents it.

The table and filters have not changed for the moment, that's because the final version is still under development so it has been decided to make this kind of "hybrid" version that

combines all the new environment with the previous data access part. This decision is due to the fact that the implementation of everything related to the data consultation is much more difficult than the design part alone and, in order not to lengthen too much the release time of the new version that will really improve the user's sensations (or so we will verify in the heuristic evaluation), this combination has been launched.

All that is new has been implemented with the "npm" package management system and the TypeScript language. This has allowed us to optimize the download times since the compilation is done at runtime.

3.1 HEURISTIC EVALUATION OF THE NEW INTRANET

The evaluation of the new version of the intranet will be carried out following the same pattern as the previous evaluation so that the results are as fair as possible. First I will answer the questions proposed by Toni Granollers and then I will comment in more detail on the points that I consider most important and that, above all, have made a big difference compared to the previous one.

1. Does the application include a title page, section or visible location?: **Yes (1)**
2. Does the user always know where he/she is?: **Yes (1)**
3. Does the user always know what the system or application is doing?: **Yes (1)**
4. Are the links correctly defined?: **Yes (1)**
5. Can you visualize all the actions directly? (No other actions are required): **Neither yes nor no (0,5)**
6. Does the information appear in a logical order for the user?: **Yes (1)**
7. The design of the icons corresponds to the everyday objects: **Yes (1)**
8. Does each icon perform the expected action?: **Neither yes nor no (0,5)**
9. Does the system use phrases and concepts familiar to the user?: **Yes (1)**
10. Is there a link to return to the initial status or home page?: **Yes (1)**
11. Have the functions "desfer" and "refer" been implemented?: **No (0)**
12. Is it easy to return to a previous status of the application?: **Yes (1)**
13. Do the link labels have the same names as their destinations?: **Yes (1)**
14. The same actions always have the same results?: **Yes (1)**
15. All icons have the same meaning everywhere?: **Neither yes nor no (0,5)**
16. Is the information displayed coherently on each page?: **Yes (1)**
17. Are the colors of the links standard? If no, are they suitable for your use?: **Yes (1)**
18. Do the navigation elements follow the standards?: **Yes (1)**
19. Is it easy to use the system for the first time?: **Yes (1)**
20. Is it easy to locate information that you have already searched for before?: **Yes (1)**
21. Is it possible to use the system at any time without remembering previous screens?: **Yes (1)**
22. All the necessary content for navigation or task is on the "current screen"?: **Yes (1)**
23. Is the information organized according to a logic familiar to the end user?: **Yes (1)**
24. Are there any keyboard shortcuts for common actions?: **No (0)**
25. If so, is it clear how to use them?: **Not applicable (-)**
26. Is it possible to easily perform a previously performed action?: **Yes (1)**
27. Does the design adapt to the screen resolution changes?: **Yes (1)**
28. Is the use of accelerators visible to the normal user?: **Not applicable (-)**
29. Does it always keep the user busy? (without unnecessary delays): **Not applicable (-)**
30. Is a message displayed before performing irreversible actions?: **Yes (1)**
31. Are errors shown in real time: **Neither yes nor no (0,5)**

32. Is the error message that appears easily interpretable?: **Neither yes nor no (0,5)**
33. Is any code used to refer to the error?: **Neither yes nor no (0,5)**
34. Does a confirmation message appear before performing the action?: **Yes (1)**
35. Is it clear what has to be entered in each box of a form?: **Yes (1)**
36. Does the search engine tolerate typing and spelling errors?: **No (0)**
37. Is a design without redundancy of information used?: **Yes (1)**
38. Is the information brief, concise and precise?: **Yes (1)**
39. Each element of information is different from the rest and is not confusing?: **Yes (1)**
40. Is the text well organized, with short sentences and quick interpretation?: **Yes (1)**
41. Is there a "help" option: **Neither yes nor no (0,5)**
42. If so, is it visible and easy to access?: **Not applicable (-)**
43. Is the help section aimed at answering questions?: **Not applicable (-)**
44. Is there a FAQ section?: **No (0)**
45. Is the help documentation clear, with examples?: **Yes (1)**
46. Can users continue from a previous status (where they were before or from another device)?: **Neither yes nor no (0,5)**
47. Is the "autosave" implemented?: **No (0)**
48. Does the system have a good response to external failures?: **No (0)**
49. Does the typography have an adequate size?: **Yes (1)**
50. The typography uses colors with enough contrast with the background?: **Yes (1)**
51. Do the background images or patterns allow the reading of the content?: **Yes (1)**
52. Do you consider people with reduced visibility: **Not applicable (-)**
53. Do you keep the user informed about the status of the system?: **Neither yes nor no (0,5)**
54. In addition, is the status of the system visible and updated?: **Neither yes nor no (0,5)**
55. Can the user make his own decisions? (Personalization): **Yes (1)**
56. The system offers the option to return to the factory settings?: **Yes (1)**
57. If so, does it clearly indicate the consequences of the action?: **No (0)**
58. Is the term "default" used?: **No (0)**
59. Is the execution of heavy work transparent to the user?: **No (0)**
60. While heavy tasks are being performed, is any animation shown to the user during the remaining time?: **No (0)**

Total of questions without the not applicable ones: **54**

Total number of questions answered with "Yes": **34**

Total number of questions answered with "No": **10**

Total number of questions answered with "Neither yes nor no": **10**

Total points: **39/54**

With the implementation of the new design, bearing in mind that it is not finished, the improvement has already been remarkable since the score has increased by 6 points (11.11%). In summary, the final grade was 72.22%.

3.2 DISCUSSION OF THE RESULTS

Moving on, I will comment on some of the points that I consider most important, either because of the change from the previous version or, on the opposite, because it has not been updated and I believe it should have been, as I did in the previous evaluation.

Many of the points commented remain in the same way since we continue using the table and the previous filters. In the case of questions 1 and 2, the answer continues to be yes, although the implementation is much more correct and understandable.

The order of the information (questions 6 and 23), as we have already mentioned, has improved and increased the evaluation grade.

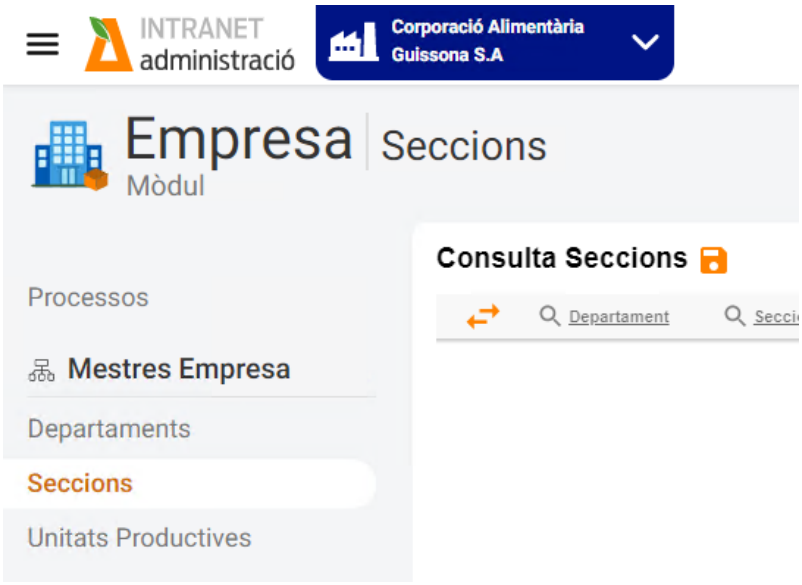


Figure 25 – Extended view of the selectors

The icons are also a point of improvement (questions 8 and 15), since each module now has distinctive icons and they are not confusing, although the problem of printing icons remains. Thanks to the minimalist design, intuitive and consistent with current standards, it is very easy to use for the first time (question 19), unlike the previous one.

In neither of the two versions are spelling or typographical errors (question 36) tolerated in the search engine, because the only existing link, at the moment, is the link to the database, which does not allow errors. In the near future, it is planned to be able to search for

modules and sub-modules from any part of the intranet through an intelligent general search engine that tolerates not only errors but also different ways of obtaining the same result.

Another improvement that will be included when there will be a new tab page for the new design, instead of using the previous one, will be in the filters. The drop-down menu on the right will disappear and a horizontal bar will be developed on top of the results that will allow to visualize all the applied filters at any time, without having to open a menu that brings visibility to the results.

4. ANALYSIS OF THE RESULTS OF HEURISTIC EVALUATIONS

As we have seen previously, the implementation of the changes that have been made up until now have meant a significant improvement in relation to design and usability.

In the field of design, the difference is much greater than that of usability and is present at all times. From the change on the headings, through the incorporation of icons to the menus and even affecting the navigation paradigm that has always existed, the new intranet gives a much renewed image and has really brought improvements, as we have seen in the relevant heuristic evaluation.

The difference was 6 points (11.11%), as we have seen above, but this difference was caused by some added functionalities, not only by the design. The evaluation questions that have been answered differently from the evaluations are the following:

- **1. ● Does the application include a title page, section or visible location?**

The answer has changed from "Neither yes nor no" to "Yes".

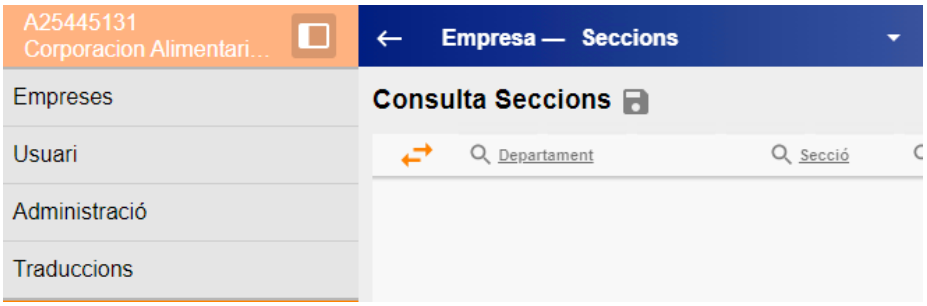


Figure 26 – Enlarged view of the current intranet

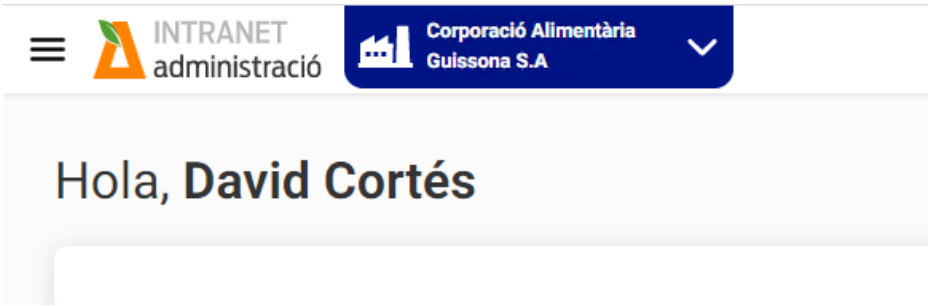


Figure 27 - Enlarged view of the current intranet

The first version included a small text indicating the selected company, but no symbol or title identifying the administration intranet page, as has been added to the new version, which also allows the company name to be read fully.

- **5. Can all actions be viewed directly?**

The answer has gone from "No" to "Neither yes nor no".

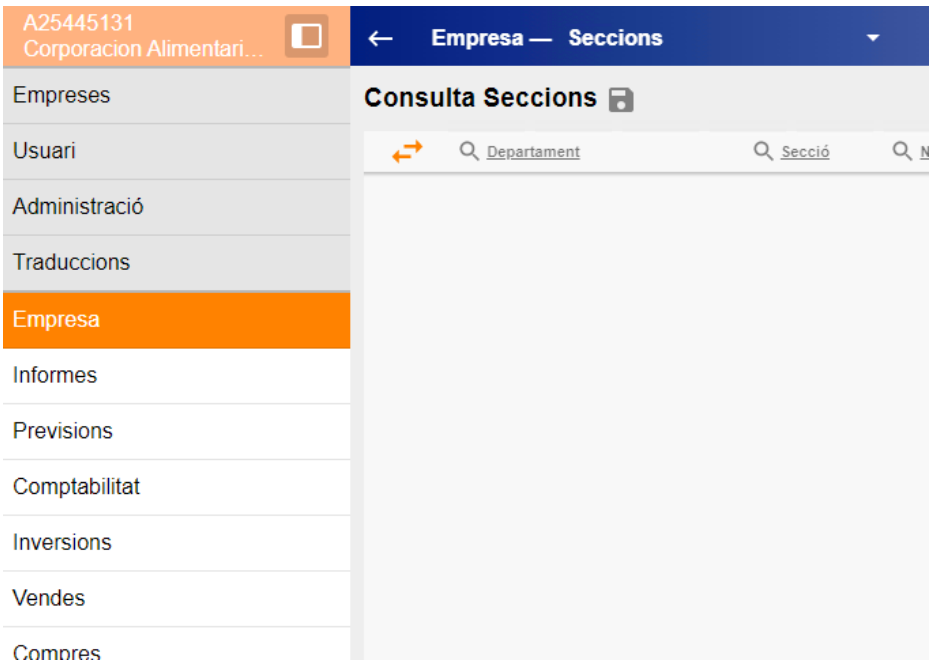


Figure 28 – Module "empresa" "seccions" sub module of the current intranet

In the first version, if we want to change the selected company, we have to enter the option "Companies" of the lateral menu, and if we want to change the sub-section (or sub-module), we will do it by using the drop-down menu above. In this way not all the actions that can be performed are visible directly.

Figure 29 - "Empresa" module "seccions" sub module of the new intranet

In the new version, we have the company drop-down visible at all times, and in a more natural position. The sub-section selector, on the other hand, is displayed expanded and

accessible, without taking up space on the results table, as it interchanges position with the other one.

- **6. Does the information appear in a logical order for the user?**
- **23. Is the information organized according to a logic familiar to the end user?**

The answers have gone from "No" to "Yes". This change goes hand in hand with the previous answer, since the change of position and format of the menus has restructured the information so that it is now much more logical for the user.

- **10. Is there a link to return to the initial status or home page?**

The answer has changed from "Neither yes nor no" to "Yes".

Since in the first version the main page of the system is the company selector, there is no button to return to the start as such, but we can always return to the company selector, which works in the same way.

Figure 30 - Company selector of the current intranet

Unlike the new version, which does have a home page and a button to return to it, located at the top left of the screen, a familiar position for the user.

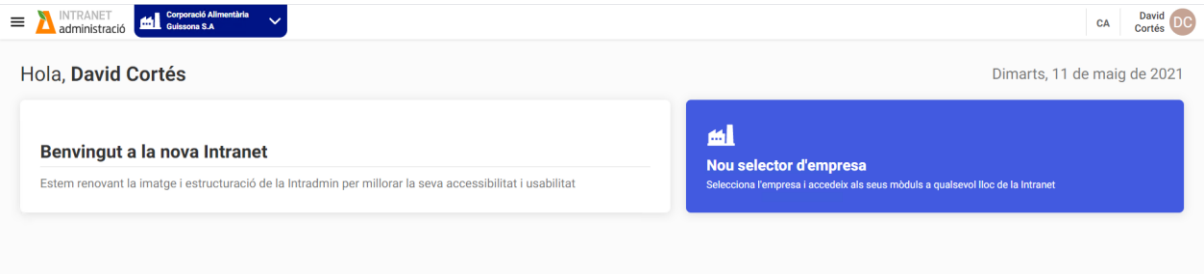


Figure 31 - Home page of the new intranet

- **15. Do icons have the same meaning everywhere?**

The answer went from "No" to "Neither yes nor no". When I analyzed the results of the heuristic evaluation of the previous intranet, I explained that some icons, such as the download icons, do not mean the same thing in one place as in another. Since the new intranet still has parts of the previous one, this problem persists, but the number of repeated icons has been reduced and all new icons go through a design and testing process to avoid these usability problems in the future.

- **19. Is it easy to use the system for the first time?**

The answer has gone from "No" to "Yes". It is clear that the first version of the administration intranet is not easy to use for the first time, and a case where I have been able to prove it is on my own back, when I started working with the company it took me a few minutes to understand how it worked, a colleague had to explain it to me, which is something unforgivable for design students, since a well designed system doesn't need anyone to explain how it works.

The new intranet, due to the incorporation of many more design principles and dedication, together with the new help functions, is much easier to use, more intuitive.

- **41. Is there a "help" option?**

The answer has gone from "No" to "Neither yes nor no". This answer would have been a "Yes" if we had done the evaluation later on, since we are currently developing a dynamic help or documentation page that can be displayed by users from wherever they are and that automatically exposes all the information they may need depending on the location of the system where they are. Currently, however, this is not yet finished and the main improvement in this point has been the incorporation of the button "Are you having

problems logging in?" that appears at the login and provides help in case we have forgotten the password or any other internal problem.

Figure 32 - "Tens problemes per accedir?" button

The best way to ensure that a design will be successful in terms of usability is to apply (or not, in the principles considered negative) **Gestalt design principles** (psychology of form or psychology of configuration). In this project some of them have been considered, here we will see how they have been applied and why.

4.1 DESIGN PRINCIPLES USED

In the first version we found the existence of **Horror Vacui**, " terror of the empty space", this design principle expresses the desire or tendency to fill all the empty spaces of an environment with information or objects, it is the opposite of minimalism. This application can be interesting in some areas but it always has to take into account the repercussions, the "empty horror" directly affects the perceived value of a website, as the volume of elements increases, the perceived value decreases. To understand this design principle in a clearer way and in a real context, I propose the following example of the Empty Horror: on the one hand we have a clothing store with many shelves and shelves full of clothes, many posters indicating prices and discounts. On the other hand, a shop with practically no clothes shop, some mannequins and non-existent signs, which is also clean and robust.

Figure 33 – Example of Horror Vacui

Figure 34 - Example of the absence of Horror Vacui

The perceived value of one store and the other is completely different, in the first case we think that it is a store with low prices and low or medium quality clothes, in the second, on the other hand, suggests that it is a store with high quality clothes and, surely, much more exclusive.

This teaches us that including information and objects at first glance does not necessarily mean an increase in perceived value, rather it can work against it. That is why the new intranet design, much more minimalist, is perceived as if the quality and robustness were superior. In contrast, the previous design shows so much information and colors that we involuntarily value the design more negatively.

Another design principle applied in the new design that was not applied before is **Aesthetics in Ease of Use**. This design principle describes an effect that occurs in aesthetic designs, since they are perceived as easier to use than non-aesthetic ones, regardless of whether they are actually easier to use or not. This effect increases the likelihood that the system will be used, since users think that everything they need will be easy to do.

A real case of application of this design principle in the new intranet are all the aesthetic elements that have been added in addition to some animations, for example when we deploy a menu does not appear simply as in the previous design, but a short animation that really gives the feeling that the menu is "opening" or "deploying".

In order to prevent unintentional actions, the design principle of **Confirmation** is applied, requiring the verification of the actions before they are performed, also known as verification process. In this system it appears in many sections that request a double confirmation at the moment of making a very heavy database query that will take a lot of

time, relatively speaking. Thanks to this technique clients can cancel the process when they see an estimate of the total time.

Following the design principal of the **Iconic Representation**, most of the intranet buttons are represented only, or together, with icons. In the new version, the number of icons has been increased, which helps to recognize the sections or actions they represent. However, it is not advisable to abuse this technique because a screen full of icons without more information increases the work of the user to think what they symbolize.

The principle of **Visibility** also appears on the intranet, which explains that systems are more usable when they clearly indicate their status, the possible actions that can be taken and the consequences of the actions already taken. For example, a red light can be used to indicate whether a device is running or not. In this case study, it is applied in the query tables, since while the system is making requests and waiting for a response the message "Running" appears, while waiting for a query "Waiting" appears and when there has been an error "Error" appears.

We also see the principle of **Similarity**, which states that elements that are similar are perceived as more related to each other than those that are different. This similarity can appear in color, shape, size or location of the elements.

Figure 35 - Example of similarity

In this image we can appreciate three different sets where the similarity is applied in different ways. In the first case, we can relate the key shapes, we guess that they have something in common, regardless of the shape and location of these elements. In the second set, the larger shapes share, surely, the importance, superior to the rest of the elements. In the last case, they share color and size but the shape is the one that creates a relationship between the squares and the circles.

We can see this applied to the design of the intranet, since some buttons have a descriptive text, or title, and a red background that gives them a rectangular shape, then we relate all these similar buttons and we can guess that they will have a similar function of importance among them. Other buttons, are only an icon and do not contain text (at least at first sight, since they do contain a "title" that is seen when we pass the cursor over it), these complete some other functions that also have some kind of relationship.

To create a successful design some say that the most important terms are aesthetics, others functionality and others usability. Raymond Loewy, one of the best known industrial designers of the 20th century, defined success in commercial performance. He claimed that aesthetic beauty was a balance between two variables: familiarity and uniqueness. To find an optimal balance between these two variables means to find the exact point of success, this point is identified as "**Most Advanced Yet Acceptable**" (MAYA). The most advanced form of an object but one that is still recognized as familiar is the one with the best prospects for commercial success.

Users need familiar objects or environments but the key is that it also has an innovative part, especially in design-specialized environments, as these communities value originality more. Furthermore, by relating this concept to the Von Restorff Effect design principle, users tend to remember novelty over the more typical.

Considering MAYA when we are designing for a large number of people can make a difference. However, this is not applicable in contexts where the evaluation of aesthetics is carried out by designers or art experts; in these cases MAYA does not apply, since only artists or designers are looking for innovation and originality, instead of designing for a public which is not an expert in design.

An example of this phenomenon can be seen by studying the design of the chains and their evolution over the years.

Figure 36 - Example of "Most Advanced Yet Acceptable"

The chair on the left, a traditional upholstered armchair, served as a cognitive prototype of an office chair for more than fifty years. In 1992 the "Aeron" model was introduced, the central image, which reached many more consumers because of its innovative shape and familiarity with the traditional model. The model we see in the image on the right ("Variable Balans"), on the other hand, has been on the market since 1976 and for many consumers it is very different or "futuristic" because the way it is to be used is different from the rest and does not have any familiarity with the rest. This has meant that the attention received has been almost exclusively from the design community, as the novelty is much more widely accepted.

If we want to relate all this theory to the design we are analyzing, we can observe that it is definitely familiar since the structure and functionality are not unique in the world (especially in the new design since it has a more familiar and intuitive structure). If the current design does not include major innovations, the new design will incorporate some novelties that are not very common in the world of intranets but are still familiar.

An example is the filter system, which currently has a menu full of text type inputs, selector or radio button that are often not mandatory, but the user has to see them anyway. For the new design is being implemented, from the team I'm part of, a new system for filters inspired by the one used in Microsoft Azure.

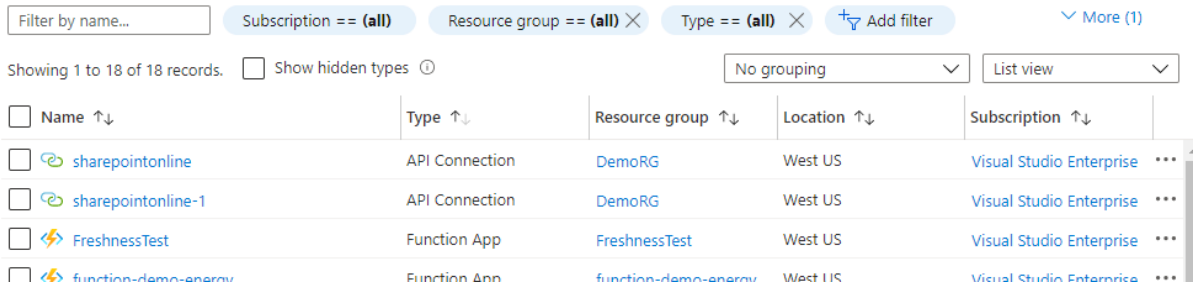


Figure 37 - View of Azure filters

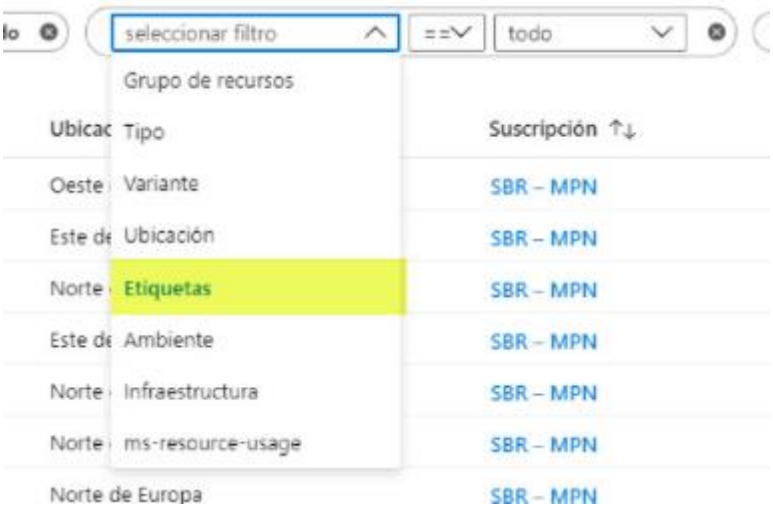


Figure 38 - Azure filter editing view

This system places the filters at the top, just above the table where the results are displayed instead of the location on the right, with the possibility to hide it as it was until now. In addition, this allows not to show by default the fields that are not mandatory, only those that are. We have them always in sight as we can see in the first image and we can edit or add them, what will be shown is similar to the second image, first a selector of the filter that we want to apply, then the operation (equal to, bigger than, smaller than...) and finally the value to close.

Design by Committee is also one of the design principles applied in this design, it is a design process based on consensus building, group decision making and extensive iteration. For my part, I have collaborated in this practice in group decision-making and consensus-based design of the new intranet.

It is common to believe that a design where a single responsible has made the decisions and designed the elements will have a higher consistency than a democratized design where maybe there is "a bit of everything". But that is only a simplification and generalization.

Design by committee is preferred when projects are quality-driven, with complex requirements, the consequences of errors are serious and user participation is important. It is also interesting that committee members are diverse and biased, and influence among members is minimized. Input from members and contributions must be collected and shared efficiently. Autocracy, on the other hand, is linear and fast, but hurried and error-prone.

In this case, in the new intranet, as I mentioned, it has also been applied and one of the points where we can see it is in the prototype, since a color palette has been designed for each of the elements and the context, in addition to the form of all these elements as text or data entry elements.

Figure 39 – Color palette

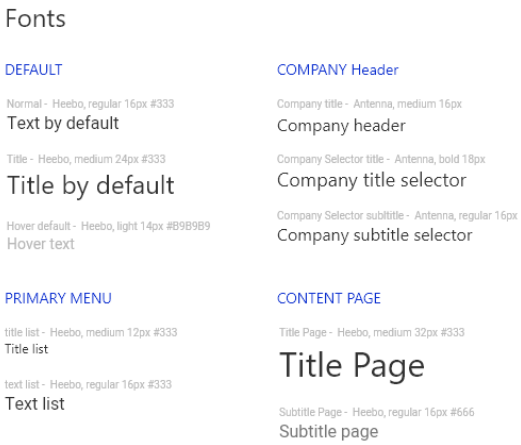


Figure 40 – Fonts used

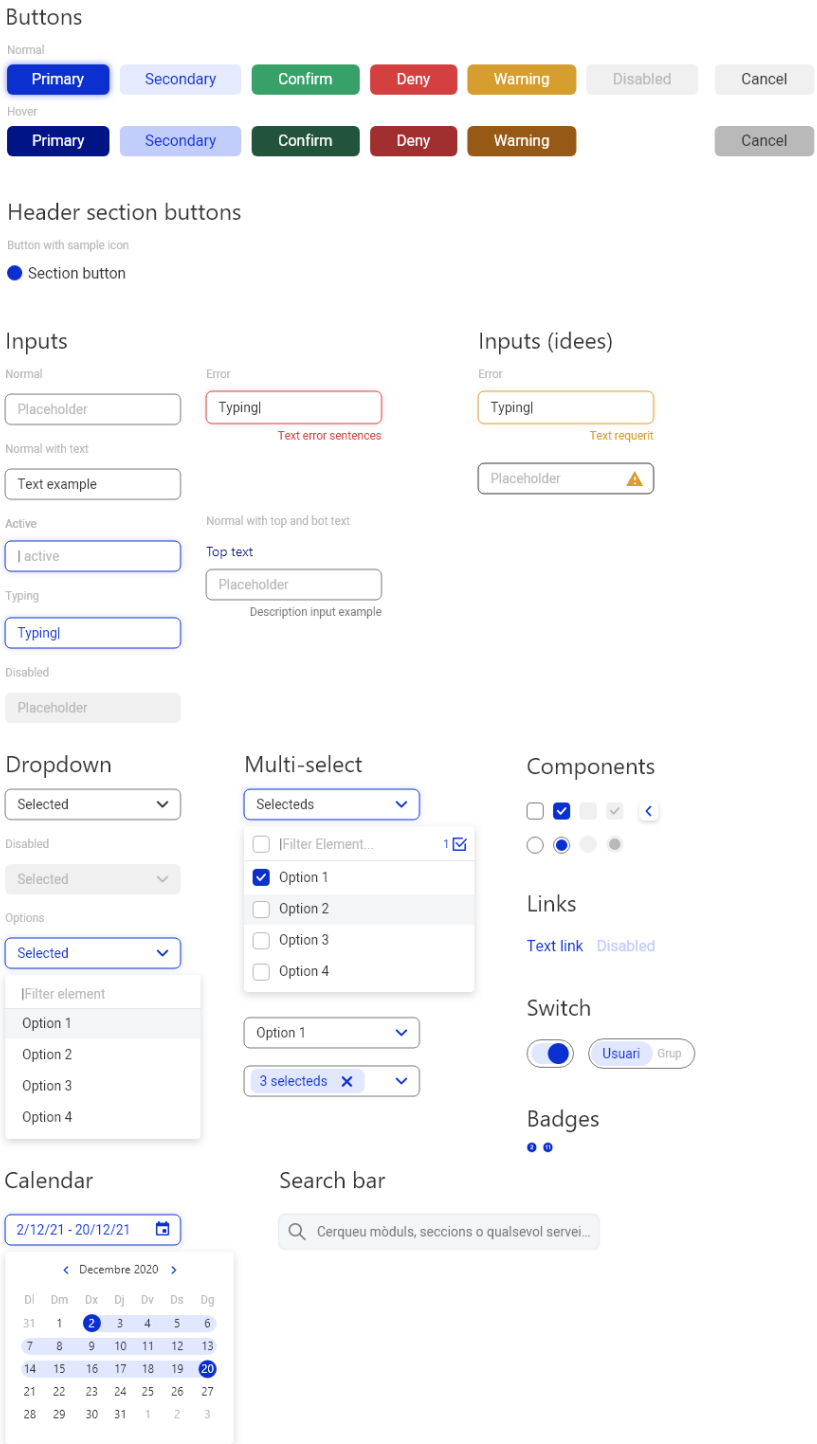


Figure 41 – Inputs design

One more design principle that has been applied is **Form Follows Function**. This design principle states that the beauty of the design results from the purity of the function, i.e., the descriptive interpretation is due to the fact that the beauty results from the purity of the function and the absence of ornamentation. Based on the criteria for success, it is vital in making decisions to focus on the relative importance of all aspects of design, form and function.

To give a visual example, a plot can help us. If the criterion for success is speed and accuracy, then digital visualization is superior. If the criterion is based on pure aesthetic terms, a minimalist analog visualization is better.

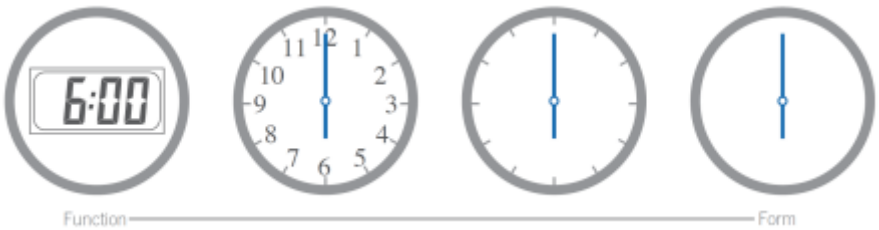


Figure 42 - Example of "Form Follows Function".

In this image we can see an example of a digital plot (function predominates) and a minimalist analog plot (form predominates).

We can extrapolate this to the intranet, since the previous design showed a side menu with the names of the modules (following the function) and now shows icons, closer to the form.

Finally, the **Hierarchy of Needs** design principle has been applied. To make a successful design, you need to satisfy the basic needs of the users before trying to satisfy higher level needs. The hierarchy of the five levels of key needs are:

- Functionality
- Reliability
- Usability
- Competence
- Creativity

Functionality always tries to meet the most basic requirements of design, for example, an audio player must be able to play sound, rewind and scroll between tracks. At this level, designs are perceived as having little value.

Reliability has to do with establishing a stable and consistent performance, for example, a video recorder must perform consistently and play back recorded programs with an acceptable level of quality.

Usability refers to how easy a design is to use, as we have seen above.

Competence is about making it easier for users to perform tasks in a better way than they did before.

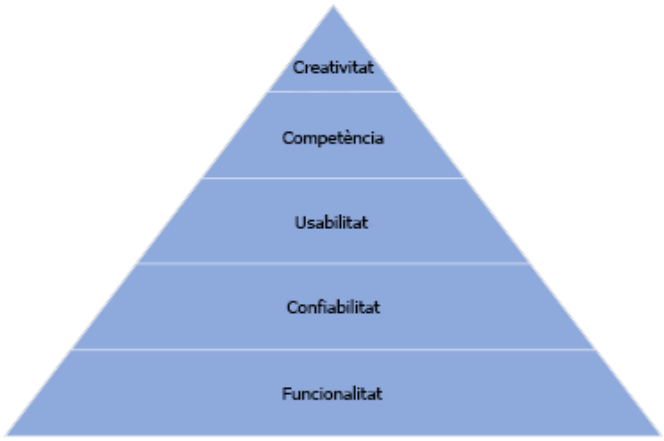


Figura 43 - Jerarquia de Necessitats

Creativity, finally, is the level of hierarchy that is achieved when all other needs have been satisfied and users have begun to interact with design in innovative ways.

The information used for the drafting of this section has been taken from the GTIDIC material on these design principles [14].

5. ASPECTS TO IMPROVE

Next we will see which are the evaluation questions that have obtained a score of 0 (No) or 0.5 (Neither yes nor no) that I consider that applying the improvements that I will suggest in the prototype section will increase these scores and, therefore, increase usability.

The points to improve are the following:

(Question 5) Can all actions be visualized directly? (No other actions are required): **Neither yes nor no (0,5)**

(Question 8) Does each icon perform the expected action?: **Neither yes nor no (0,5)**

(Question 15) The icons have the same meaning everywhere?: **Neither yes nor no (0,5)**

(Question 31) Are errors shown in real time: **Neither yes nor no (0,5)**

(Question 32) Is the error message that appears easily interpretable?: **Neither yes nor no (0,5)**

(Question 33) Is any code also used to refer to the error: **Neither yes nor no (0,5)**

(Question 36) Does the search engine tolerate typographical and spelling errors?: **No (0)**

(Question 41) Is there a "help" option: **Neither yes nor no (0,5)**

(Question 44) Is there a section of frequently asked questions: **No (0)**

(Question 53) Do you keep the user informed about the status of the system?: **Neither yes nor no (0,5)**

(Question 54) In addition, is the system status visible and updated?: **Neither yes nor no (0,5)**

(Question 59) Is the execution of heavy workloads transparent to the user?: **No (0)**

(Question 60) While heavy tasks are being performed, is any animation shown to the user during the remaining time?: **No (0)**

These are the questions of which I will try to improve the grade obtained in the last heuristic evaluation, in this list you can also see this last grade.

6. PROTOTYPE

The first improvement I will apply is focused on improving the aspect dealt with in question 5 ("Can all actions be viewed directly?"). Although this question was also penalized by the fact of not being able to see the filters automatically in the sections destined to database queries, as is mostly the intranet, it was also taken into account that there was no content on the main screen, only a welcome without almost any information.

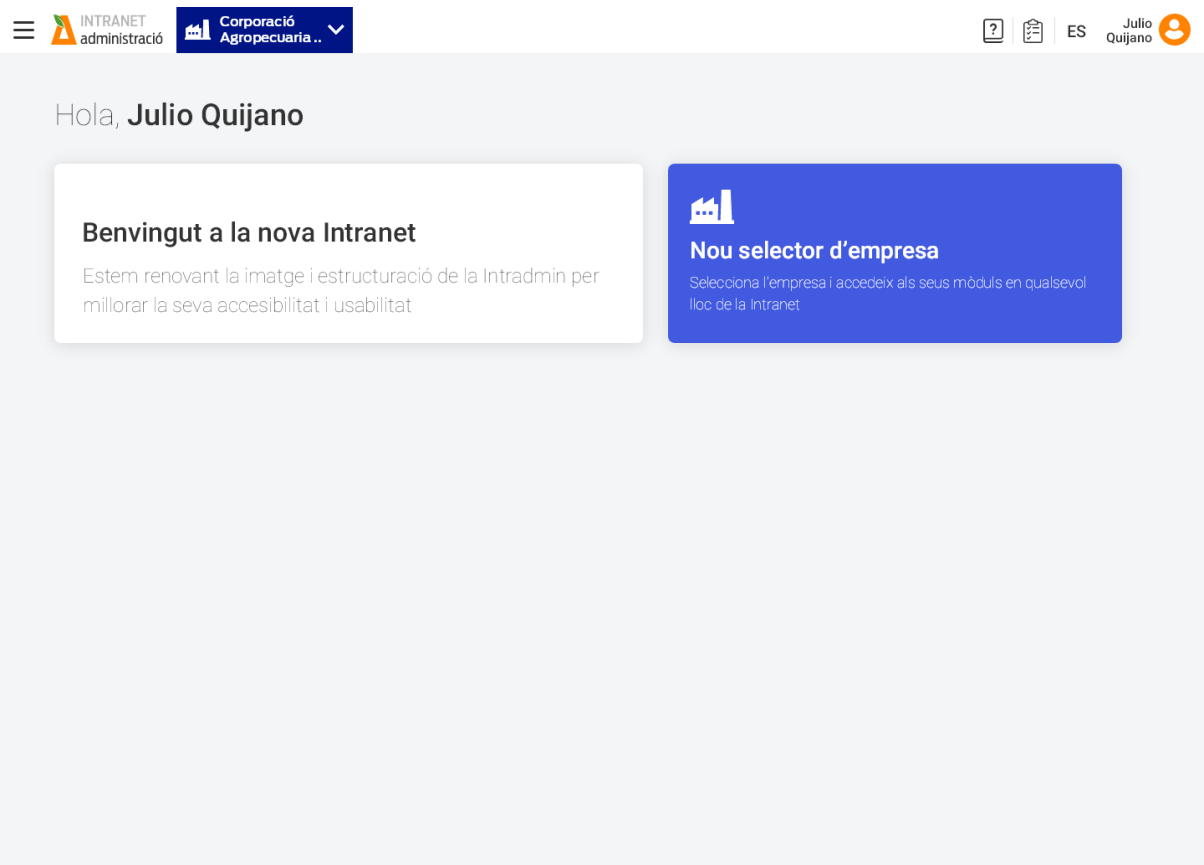


Figure 44 – Home of the new intranet

Due to this last weakness I have decided to design a proposal of content to the main screen, as we can see below.

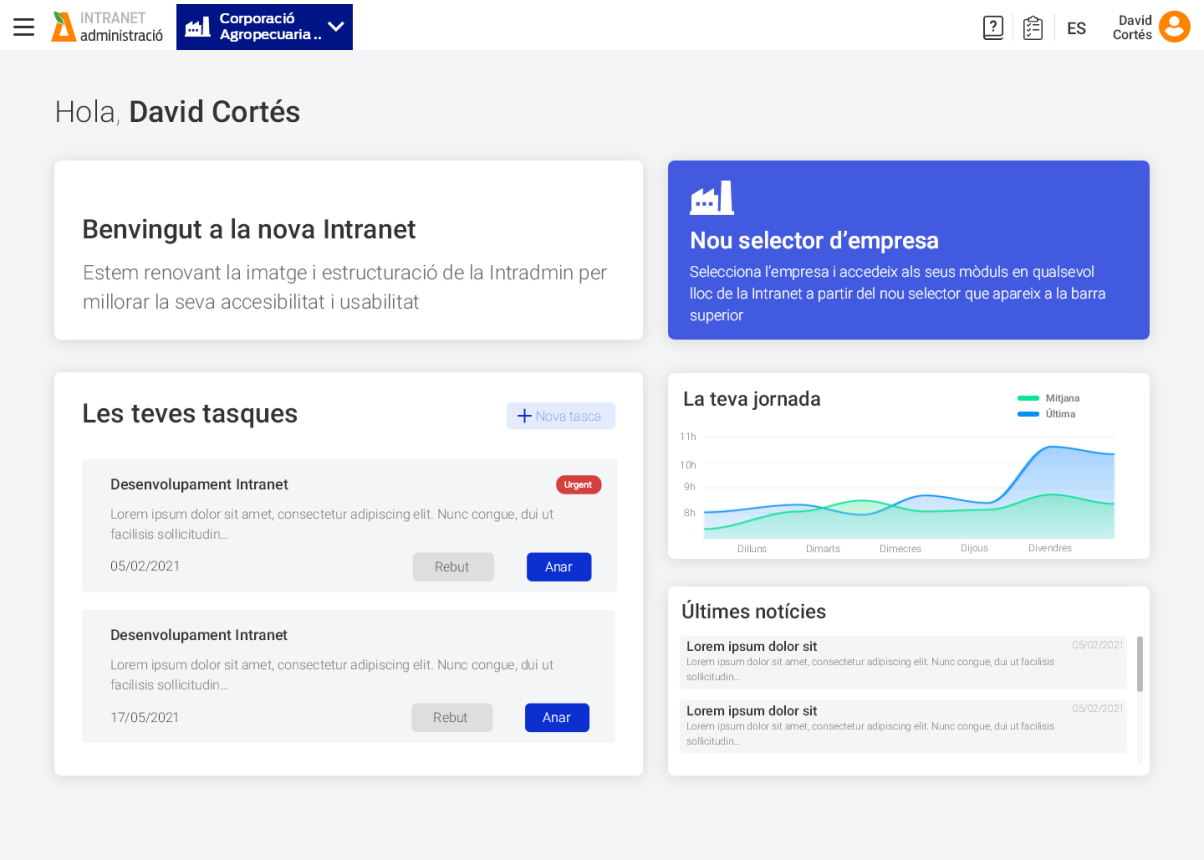


Figure 45 – Proposed new intranet home page

This proposal incorporates an immediate view of the tasks assigned to the user who enters the intranet, so that he does not have to enter specifically to the corresponding section, but from the first moment he is aware of them.

It also includes a graph showing the hours worked by this user in recent days, and the average, and a news section where you can see the most recent articles published by the company magazine "InfoAgrupa".

This improvement increases the score of question number 5 from 0.5 to 1.

The second proposed improvement is simple to incorporate, it is about changing the icons that perform different actions, related to questions 8 and 15. The proposal is to change the "download" icon in the filter menu, which is the one that performs a not so expected action: it performs a new query and displays the result in the filter, but it may not be what we are seeing on the screen.

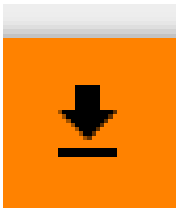


Figure 46 – Current download icon

Figure 47 – Proposed download icon

My proposal is to replace this icon in cases where a query that saves its results in a fitxer is performed by this other icon that we can see in figure 47.

In this way, the two icons are differentiated and the proposed one has a much more appropriate representation for the objective of the button.

This improvement increases the score of question 8 from 0.5 to 1 and that of question 15 from 0.5 to 1.

The following improvement proposal tries to solve the problems related to the error messages, currently there is no error message per defect that indicates a reference code to the user.

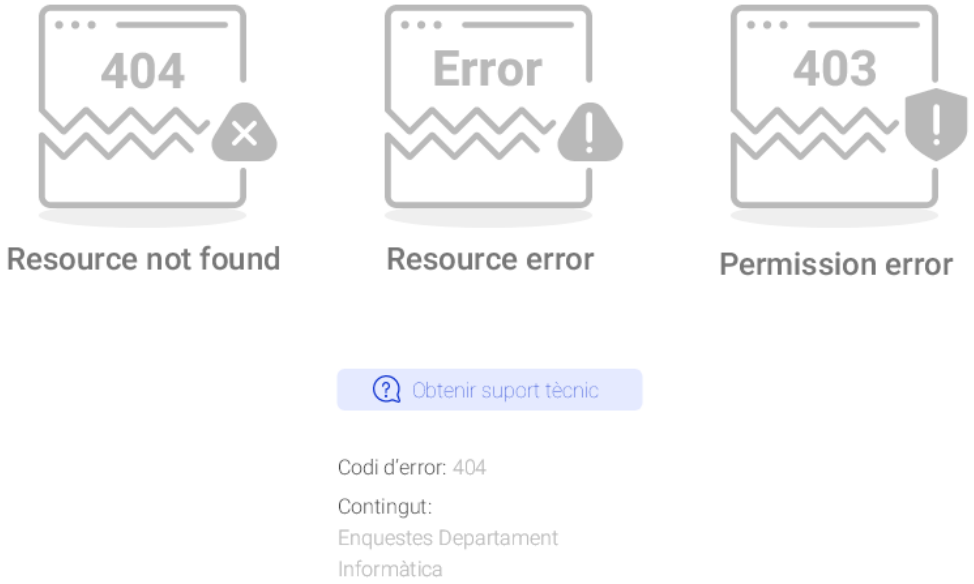


Figure 48 – Proposal of error messages

This proposal includes different images to include at the top of the message, depending on the error that the requests return, containing a small icon and a text related to what has happened. It also includes an error code to be able to reference it when contacting support, a brief description and a button to access this technical support that can help the user to understand why this error has occurred and/or solve it.

The idea is that this screen is always displayed immediately when an error occurs, so far the error messages are not always the same, since in some cases a message of this style appears:

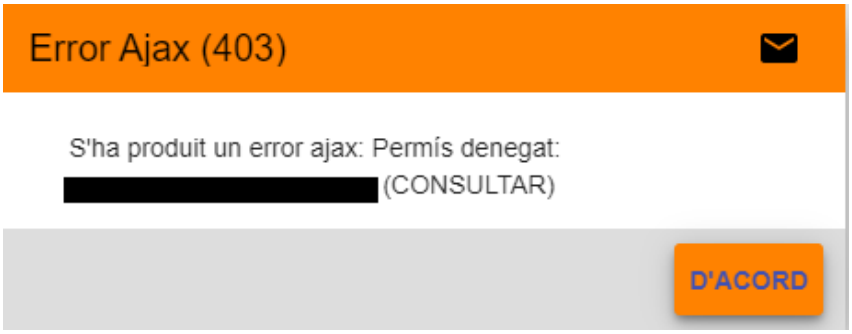


Figure 49 – Pop-up error 403

This contains a brief description of the problem, the error code and a button with an envelope, which allows you to send a message to support, but this error does not always appear and does not match the aesthetics of the new intranet. In other cases only this text appears saying "Error" where the results are expected:

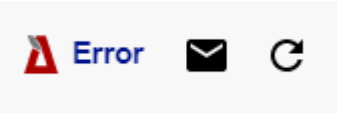


Figure 50 – Error message without specification

It also includes the button to notify support and, in addition, the option to try again, but no error code or description appears.

This improvement increases the score for question 31 from 0.5 to 1, for question 32 from 0.5 to 1, and for question 33 from 0.5 to 1.

Another improvement that I propose is the search tool. This option does not exist, yet, in either of the two versions. It is an entry point to access any part of the system, we can search for modules, sub-modules or users. This way we can access any part of the system without having to navigate there or get the phone number or email address we may need from any employee.

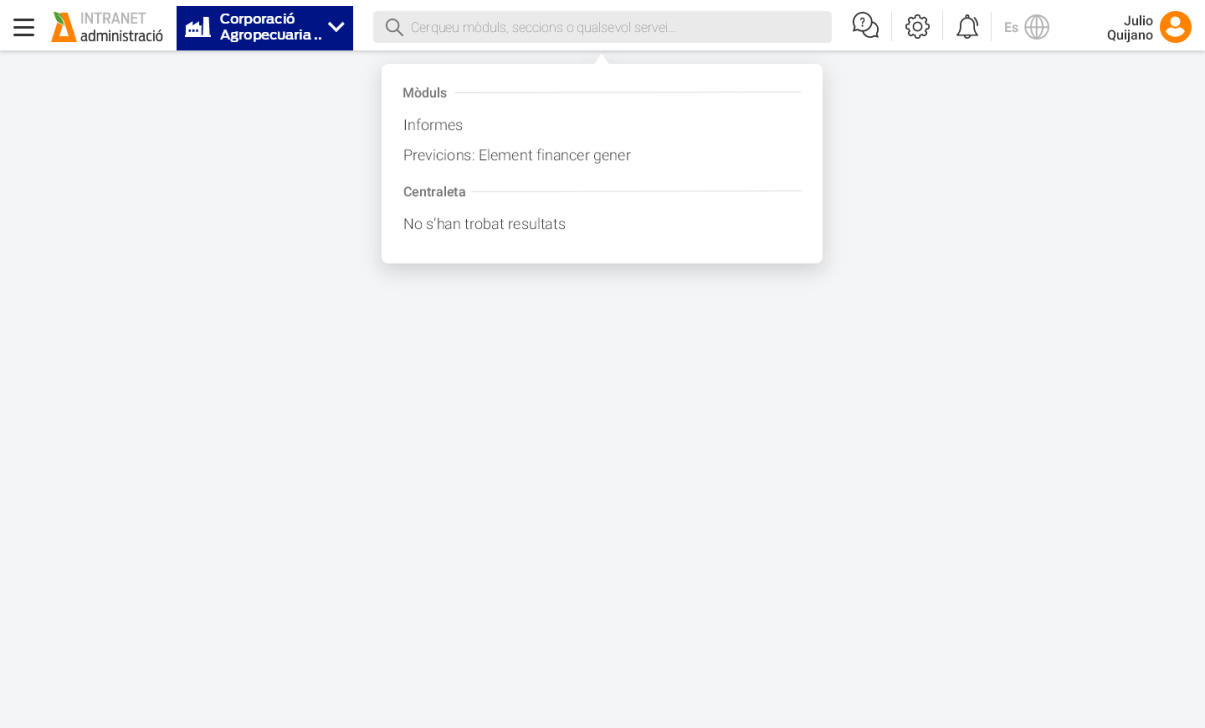


Figure 51 – Proposed search tool

This browser should tolerate spelling errors, the absence of accents and not distinguish between upper and lower case letters, so that this does not hinder users from accessing the point they wish to access.

This improvement increases the score for question 36 from 0 to 1.

As an improvement, I also present the following, it is about a section of documentation or help accessible from any point of the system, it works through the button at the top that will have this icon:

Figure 52 – Icon to access the documentation

Once we open it, we will see a manual that explains in detail what we can do on the page where the user is located and a guide to use the elements that appear on the page. For example, in the case of a selector, the user may not understand what it is used for or how to use it, by reading this manual he will be able to see and understand it in detail.

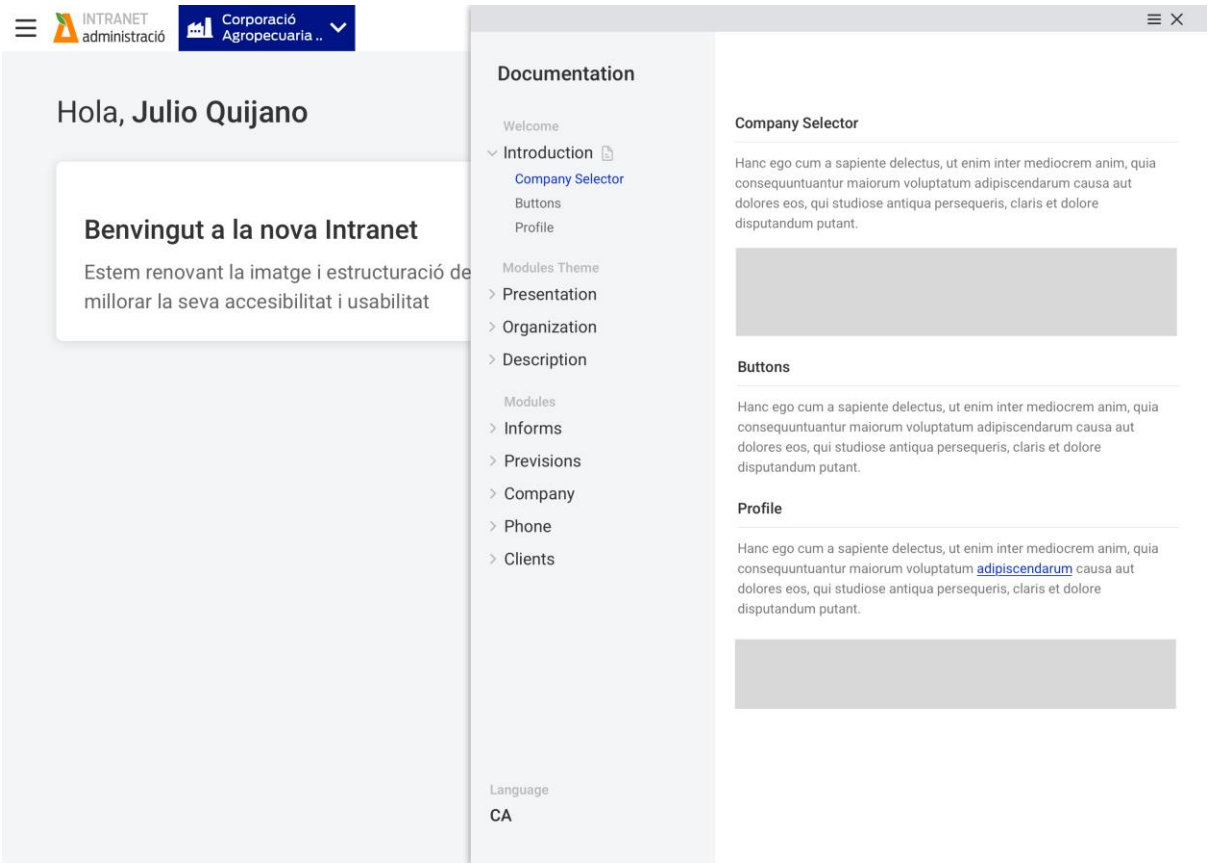


Figure 53 – Documentation section

It is also accompanied by a language selector and a summary of the information it includes to ensure that all users understand it and that the speed at which it is learned is high.

This is already under development at the moment (July 2021) and is expected to greatly improve user experience and, above all, usability.

This improvement increases the score of question 41, from 0.5 to 1, and that of question 44, from 0 to 1.

As a last improvement proposal, I have designed a charging screen that aims to improve the current one, which only shows the word " Loading":

Figure 54 – Loading screen

My proposal is as follows:

Figure 55 – Proposed loading page

On this screen we can see a download bar that visually shows the progress of the data download, as well as a percentage and an approximate remaining time.

In this way users know if the data download is progressing and there has been no problem, or if it has stopped at some point. In addition to knowing the approximate remaining time, since currently if it is not a download of a lot of data, the system does not warn of the estimated time.

This improvement increases the score for question 53 from 0.5 to 1, for question 54 from 0.5 to 1, for question 59 from 0 to 1, and for question 60 from 0 to 1.

As a result of the improvements made in this prototype, the usability of the intranet increased its score by 8.5 points. If we add these points to its previous score of 39/54, **the final score is 47.5/54.** Expressed in percentages, this is equivalent to **87.96%.**

This prototype improves the usability of the system by 15.75%, which is a very high figure, especially considering that the whole change from the previous design to the new one has only increased it by 11.11%.

This shows that a design focused on usability is important when trying to obtain interesting results in this type of evaluations, since it is important that a system is usable for its users. But it also shows that it will not really be very complicated to integrate into the system as there are not a large number of new elements to introduce. As we have always heard, it is the little things that make the big difference.

7. INTERVIEWS WITH EMPLOYEES

In order to demonstrate in a better way that this design approached to the prototype improves the usability of the system and to use a new methodology different from the one I have used in other cases to be able to go deeper, I will present the design personally to different employees and I will ask them questions about their opinion.

The dynamics of the surveys will be as follows:

First I will ask the following questions to the respondents:

- Which of the proposed improvements did you like the most? Why?
- Which of the proposed improvements did you like the least? Why?
- Would you make any changes to the prototype screens?
- Would you use this system?
- Do you think it improves the usability of the new version?

We will continue the conversation for a few more minutes without talking about anything in particular, because many times the respondents come to conclusions or learn some things after the survey and speak more freely. For this reason I have preferred to ask few questions and extend the free conversation.

All respondents have been presented with a consent form explaining explicitly what they will do and how their data will be treated. It can be consulted in ANNEX I.

Although in order to compare two things correctly the analysis always has to be done in the same way in all cases, I consider that once the heuristic evaluation of the prototype has been done, which I have also done for the other versions, it is convenient to go more in depth about this version because it is a version that the workers have not yet seen in full and I will be able to discuss it directly with them.

7.1 RESULTS OF THE INTERVIEWS

The interviews have been carried out to a total of 4 employees in charge of programming and/or designing systems. In this case they are my colleagues, which implies that they have been involved, in some way, in the process that we deal with in this project.

Next, I detail the answers of the interviews following the same order in all the cases, which means that the first answer of each question is always from the same person, in the same way as the second, the third and the fourth.

Regarding the first question, which refers to which of the proposed improvements has pleased the most, the answers have been:

- **The search tool:** "*Because an entry point for many actions that require many clicks increases usability and satisfaction*."

- **The documentation:** "*Because a section that is always available and that facilitates the use of the system by adapting to the user's environment is a very useful tool, especially for new users.”*

- **The error screen:** "*Because the errors that appear nowadays, besides not offering so much information, block the screen so that you can't do any other action to the system until you don't stop it*."

- **The main screen:** "*Because it is the first image that users see about the system and it facilitates many actions with this "shortcut" menu*."

As we can see, the point of view of the employees is very diverse and each one has chosen a different screen, in all cases a reasoned explanation has been given that agrees with the main objective of that screen.

The screens that were least liked by the interviewees were the following:

- **The loading page:** "*Because another smaller element would have to be designed for the cases in which what has to be loaded are small elements*."

- **The main screen:** "*Because I don't find it as useful as the other screens, because while the others solve existing problems, this one adds non-essential functionality*".

- **The download icon:** "*Because I consider that this icon would not make me clear what action it performs and I could get confused anyway. I would try to improve it on another side apart from changing the icon*".

- **Any in concrete: "***Maybe the ones that would take longer to implement like the encloser and the loading screen because they involve more effort and waiting time, although they are the ones that would change the system the most*."

In this question some interviewees have prioritized the use they would give to the screens (or the satisfaction it would bring them) and others the difference in understanding it would bring them (as in the case of the icon).

In response to the next question, about whether they would make any changes to the prototype, the users answered:

- "*The download page looks like the main page, in cases where the element is smaller, a smaller screen could be designed*."
- "*In the main screen, it could be implemented that the sections that appear are automatically selected adapted to the worker: the most visited, the day of the week...*"
- "*The download icon, could be more like a database, instead of a volume*."
- "*Any improvement. They all bring an important upgrade to the design.*"

To the last two questions, referring to whether they would use the system and whether they think it improves the new version of the intranet, all users answered yes, which endorses the result of the heuristic evaluation of the prototype, which indicated that the system had indeed improved, in terms of usability.

8. REFLECTION

During the elaboration of this work, I have worked with many different tools and I have learned a lot of things that I did not know before.

The tools I have used have fulfilled the needs I had, and I would like to comment the case of Lunacy, the graphics editor I used to make the prototype. My idea at the beginning was to design with Adobe XD, a software also very powerful but that requires buying a license and does not have full compatibility with Sketch, and us at the company have used Sketch to design all the components and pages of the system. The problem was that I don't have a MacOS computer, and Sketch is only compatible with this operating system. So the discovery of Lunacy has made my job easier and allowed me to save money on the prototype design process. It is not as famous as other editors but from my experience I recommend it to all users who need a free editor compatible with Windows and Sketch.

The elaboration of this work has also had its difficulties. First of all, the time I had available, because doing a Final Degree Project at the same time that we are studying the last semester of the degree (with the exams and the pressure that this entails) and that we are working for the Dual Training, leaves a very small time gap. However, I consider that I have managed to organize myself correctly and I have been able to carry it out within the terms that I proposed at the beginning.

Also, as a more important difficulty, it is worth mentioning that it has not helped that the new intranet has not been fully developed at any time and the functionalities and components of the site have been changing, which meant that carrying out the evaluation at one time or another could directly affect the result of the evaluation. Many aspects that I wanted to discuss in depth because they were not developed, were then carried out, and I decided to change the section where I talked about it because talking about a problem and proposing solutions when even before I started to explain it, it had already been solved was meaningless.

Having studied the GTIDIC has been perfect to be able to carry out a Final Degree Project of this style, since having studied any other degree I would not have been able to go so deep into some of the aspects.

Above all, I have used the knowledge acquired in the following subjects:

- - **Programming:** To be able to analyze why some programming languages are better than others in some cases.
- - **Interaction and Usability:** To be able to analyze usability, elaborate prototypes and evaluate interfaces.
- - **User Experience:** To be able to adopt a user-centric point of view.
- - **Specification and Analysis of Interactive Systems:** To be able to understand the fundamental principles of object-oriented design.
- - **Design and Creativity in Interactive Environments:** To get to know the principles of design, recognize the beauty of a design and learn to create consistency in attitudes, thoughts and beliefs.
- - **Web Project**: To learn about TypeScript, the language in which the new intranet is programmed.
- **- Interactive Application Design:** To learn how to apply design patterns and define robust designs.

9. CONCLUSIONS

The main objective of this paper was to analyze, following previously selected guidelines, the change of the design of the intranet of the company where the Dual Training course takes place with the one planned in order to evaluate the real improvement and determine if it has really been a change that has improved the usability of the system. Once the work has been done, I can assure that I have fulfilled this objective, because, following some guidelines that I have selected and I have explained why I have selected them, I have analyzed the system as I wanted to my initial approach to the objective.

The results obtained have been very good, since I have managed to find the weak points of the system I was analyzing, in this case the Administrative Intranet of the company where I have done the Dual Training. These weak points, later on, we have seen that they have tried to improve with the new version of the intranet and in some cases they have been achieved, thus improving usability. In other cases, however, not enough improvements had been implemented to cover some important aspects. This is where the importance of the improvement proposal lies, since it is important to comment on how the usability of the systems has changed, even though the new version is still being developed, but it is more important to explain, as an expert, what things can improve usability and why. Regarding the methodology, which I followed to carry out the heuristic evaluations, the one I followed, created by the professor of the University of Lleida, Toni Granollers [2], has helped me a lot. I am very satisfied with the precision with which it has been designed and how it works, since it is very easy to obtain a numerical score and, moreover, it not only analyzes the 10 points mentioned by Nielsen, but also adds 5 more points and asks which questions have to be answered.

The future work that remains to be implemented after the presentation of this work would be first of all the application of the changes I have mentioned to the prototype, in order to turn the results we have seen achieved in reality.

On the other hand, I could continue researching on heuristic evaluation techniques to find new weak points of the system as well as interviews to the workers who are the final users and thus improve, even more, the final result.

We should also take into account possible suggestions from users that may not have been mentioned in the interviews or are aspects that are only known through the use of the system. In this way we can keep track of the user experience as well as the usability of the intranet automatically and know directly the needs of the users.

Finally, we could also analyze the accessibility of the new version or of my proposal. This has not been done during the project because, as I commented in the initial report, I have preferred to focus only on usability, instead of all that encompasses the user experience in order to allow me to delve more deeply into some aspects that if I had to deal with more issues I would not have been able to comment.

10. REFERENCES

1. bonÀrea (https://www.bonarea.com/es). Accessed on 18/02/2021.
2. Usability Evaluation with Heurístics, Beyond Nielsen's List (https://www.thinkmind.org/articles/achi_2018_4_10_20055.pdf). Accessed on 18/02/2021.
3. Heurístic Evaluation Tool (https://repositori.udl.cat/handle/10459.1/64717). Accessed on 18/02/2021.
4. Semrush (https://es.semrush.com/blog/usabilidad-web-principios-jakob-nielsen/). Accessed on 03/03/2021.
5. Wikipedia – Experiencia de Usuario (https://es.wikipedia.org/wiki/Experiencia_de_usuario). Accessed on 19/02/2021.
6. 40defiebre (https://www.40defiebre.com/que-es/experiencia-usuario). Accessed on 04/03/2021.
7. Kschool (https://kschool.com/blog/usabilidad-ux/sabes-la-usabilidad-la-experiencia-usuario/#:~:text=Explicado%20de%20forma%20m%C3%A1s%20coloquial,la%20navegaci%C3%B3n%20por%20un%20sitio). Accessed on 19/02/2021.
8. Wikipedia – Usabilidad (https://es.wikipedia.org/wiki/Usabilidad). Accessed on 19/02/2021.
9. Wikipedia – Adobe XD (https://es.wikipedia.org/wiki/Adobe_XD). Accessed on 05/05/2021.
10. Metodologías de UX (https://blog.interactius.com/metodolog%C3%ADas-de-ux-evaluaci%C3%B3n-heur%C3%ADstica-parte-i-b5d02b566987). Accessed on 02/03/2021.
11. Wikipedia – TypeScript (https://es.wikipedia.org/wiki/TypeScript). Accessed on 02/04/2021.
12. Refactoring Guru (https://refactoring.guru/es/design-patterns/classification). Accessed on 03/03/2021.
13. Iconos8 (https://iconos8.es/lunacy). Accessed on 20/06/2021.
14. Campus Virtual UdL (https://cv.udl.cat/portal/site/102367-1819/tool/aa805aa1-2757-442b-869d-92ced5ddbde5?panel=Main#/group/102367-1819/Aula/Principios%20Dise%C3%B1o%201/). Accessed on 20/07/2021.

ANNEX I

Formulario de consentimiento informado para los usuarios

Este formulario de consentimiento informado es para el Trabajo de Final de Grado de la Universitat de Lleida: "*Análisis de la usabilidad de la intranet del grupo bonÀrea y de su actualización*". Este proyecto será realizado por David Cortés Suárez durante los meses de febrero a septiembre de 2021 en el Campus Igualada-UdL (Escola d'Enginyeria d'Igualada), bajo la supervisión del Dr. Sergio Sayago Barrantes. Este formulario contiene información sobre el procedimiento general y las condiciones del estudio.

Querido participante:

Gracias por su interés en mi proyecto universitario. Este documento describe qué se le pedirá que haga para el proyecto. También se detallarán los permisos que me gustaría que me diera. Léalo y luego firme en la parte inferior para afirmar que comprende y acepta las condiciones de este estudio. Si tiene alguna pregunta, por favor no dude en preguntarle a David Cortés.

1) Usted le da permiso a David Cortés para **tomar notas de sus observaciones** y conversaciones informales con nosotros mientras está observando el prototipo.

2) Usted le da permiso a David Cortés para **usar estas notas como fuente de información** para llevar a cabo su proyecto de investigación, que implica la publicación de resultados obtenidos mediante trabajos y la presentación de su trabajo en conferencias, charlas o exposiciones frente a profesores.

3) Usted acepta participar en **hasta 2 entrevistas**. Las entrevistas tendrán una duración de entre 5 y 15 minutos. Las entrevistas se realizarán en un punto acordado por ambas partes y serán realizadas por David Cortés.

Su tiempo: las entrevistas y evaluaciones basadas en tareas se llevarán a cabo a lo largo del estudio. David Cortés se comunicará con usted para conocer la mejor fecha, hora y lugar para usted. Su participación en este estudio es voluntaria. Puede abandonar el estudio en cualquier momento sin penalización o sin dar razones. No surge un riesgo indebido de la participación en este estudio.

Su privacidad: toda la información que brinde se almacenará de forma segura y se mantendrá separada de cualquier información que proporcione sobre su identidad. El acceso a sus datos será restringido a las personas involucradas en esta investigación, el estudiante David Cortés. Fuera de este círculo no se usará ningún nombre ni dato personal para referirse a ustedes. Si la información sobre usted se utiliza para publicaciones o presentaciones, me aseguraré de que no se haga referencia a su identidad.

Estoy muy agradecido por su ayuda. Es importante que comprenda que esta investigación no sería posible sin su participación. Por favor feche y firme esta página a continuación para indicar que comprende y acepta las condiciones de este estudio. Muchas gracias.

Yo _____ acepto participar en el proyecto de manera activa.

Datos de contacto

_____

Firma Fecha:

/ /

_____

Firma del estudiante a cargo de la investigación

_____